

EXECUTIVE SESSION

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House of Representatives

Transcript of Proceedings

Hearing held before

E X E C U T I V E S E S S I O N

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

**INFORMAL MEETING BETWEEN INTERIOR
COMMITTEE REPRESENTATIVES AND
DR. ZALMAN M. SHAPIRO**

Washington, D. C.

Thursday, December 21, 1978

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U. S. House of Representatives,
Committee on Interior and Insular
Affairs,
Washington, D. C.

The Committee on Interior and Insular Affairs met at
3:00 p.m., in room 1324 Longworth House Office Building,
Hon. Morris K. Udall (Chairman of the committee) presiding.

Members present: Representative Udall.

Staff present: Majority: Henry Myers, and Michael
McNulty.

Minority: Robert Terrell.

Appearing on behalf of Dr. Shapiro: Abe Krash, Esq.,
Leonard H. Becker, Esq., and Hadrian R. Katz., Esq., of
Arnold & Porter, 1229 Nineteenth Street, N. W., Washington,
D. C. 20036.

Chairman Udall. Are you ready to proceed?

Mr. Krash. Absolutely.

Chairman Udall. To get this thing concluded.

Mr. Krash. To answer whatever questions you have, Congressman.

Let me say Dr. Shapiro did have a short prepared statement, but rather than taking up the time, which I know is limited, what we thought was, if it is agreeable to you, because this is so informal, we just thought we would pass out copies and you can just incorporate it in the record, and we can just go ahead so we don't have to take too much time.

Chairman Udall. All right; either way, at your preference.

Mr. Krash. Sure, sure. We've got -- that's fine. I think it would be better, because it would give you -- we don't propose to take up the time. We would just appreciate it if you would just incorporate it into the transcript.

Chairman Udall. All right.

We have the machines on, and the reporter is here. All right. This statement, then, of five pages, which is undated, that begins "Statement of Dr. Zalman M. Shapiro ---"

Mr. Krash. Well, it's 12 pages -- I'm sorry. It's 12 pages with an attachment.

Chairman Udall. I've got it. It is 12 pages with a five-page attachment.

Mr. Krash. Right.

(Dr. Shapiro's prepared statement follows.)

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Chairman Udall. It will be made a part of the record at this point in this informal proceeding here today. I may want to take a 10-minute break to glance through this and see if it would prompt any questions--

Mr. Krash. Of course. I understand.

Chairman Udall. --that we may have omitted otherwise.

I also had a short opening statement. It's not all that short, but maybe to set the tone of what my purpose is here today it might be smart if I read this.

Do you have copies of this for them?

Mr. Myers. Yes.

Chairman Udall. See if you can get one, and I will begin.

This informal meeting is being conducted by me and, it says here, "Representative Bauman." His aide, Bob Terrell, is here, whom you have met, since Congressman Bauman can't make it with us today. But it is being conducted pursuant to the House Interior Committee's jurisdiction regarding federal regulation of the nuclear industry. A continuing concern of the Committee has been the adequacy of safeguards designed to protect against theft and illicit diversion of nuclear explosive materials. In early 1977, our Committee was informed that government files contained documents indicating the possibility that a substantial quantity of missing bomb grade uranium had been diverted from a processing plant operated by the Nuclear Materials and Equipment Corporation in Apollo, Pennsylvania.

While the losses in question occurred in the early or mid-1960's, I believe it is important that we explore whether there are lessons that might be derived from the events and circumstances of that period. To the extent possible, the facts should be placed on the table in order that we be able to reach the sound decisions necessary to protect against the hazards and risks of using nuclear power.

Our inquiry has several specific objectives. First, we want to understand any defects in safeguards as they existed in the 1960's so that we can be sure corrective measures have been taken. Our second objective is to know whether the Atomic Energy Commission's responsibility to encourage nuclear development forestalled its conducting with appropriate vigor an adequate inquiry into the NUMEC situation. We need to understand this to help us judge whether the old conflict between the government's promotional and regulatory activities have in fact been resolved by dissolution of the AEC and establishment of the NRC.

We have, in addition, a third purpose. It amounts to this. NUMEC has been the subject of speculation and rumor for more than a decade. All of us who have responsibilities in this area have an obligation to work toward venting what is known. The American people, who paid the bills and incurred the risks, should be able to make their own assessment as to whether their government exercised adequate caution in protecting nuclear materials, and whether all reasonable steps have been taken in search for an

explanation of NUMEC's uranium losses.

Underlying this and previous inquiries in the matter is the fact that the AEC determined in late 1965 that some tens of kilograms of bomb quality uranium had been lost by NUMEC since the plant had begun operations in 1957. After some months of investigation, the AEC accepted NUMEC's explanation that the material had been lost in the normal course of plant operations. The AEC was, however, unable to pinpoint the time at which the losses occurred or the mechanism that led to them. In accepting NUMEC's explanation, the AEC also stated that it could not unequivocally rule out the possibility of a diversion.

Our inquiry to date has found that safeguards requirements were minimal in the early and mid-1960's. They were based on the assumption that those who possessed nuclear explosive materials would not engage in complex and illegal diversions, and I might add that the financial responsibility of the companies involved would be a further deterrent. I am reading this almost verbatim, but I have changed a word or two.

We have also found that NUMEC's material control procedures were repeatedly criticized by those who conducted material surveys of the Atomic Energy Commission. In communicating with the Committee on a matter related to this inquiry, NRC Chairman Hendrie stated in December 1977 that he "... conclude(s) that for regulatory purposes we must assume the circumstances were such that a diversion could have occurred, and must construct our

safeguards requirements accordingly."

Our inquiry has shown that the Atomic Energy Commission was particularly concerned about the public reaction were it to publicize the uranium losses at NUMEC. In addition, the AEC, as a consequence of its concern for the wellbeing of the nuclear industry, acted with restraint both with regard to enforcing its own regulations upon NUMEC and imposing generally more stringent safeguards requirements.

I believe it was also out of concern for the adverse publicity and the impact of a crackdown upon the industry that led the AEC and its successor agencies to play down for more than a decade the possibility that a diversion did occur. While we were being assured by both ERDA and NRC officials as recently as the summer of 1977 that there was "no evidence" of a diversion, there were responsible officials in the government who had believed for years that there was circumstantial evidence indicating that materials had, in fact, been diverted.

We know now that as far back as 1966, at least one staff member of the Joint Committee on Atomic Energy questioned the propriety of then AEC Chairman Seabord having testified that he thought that "... there has not been any material diverted from peaceful to military uses." We know also that in December 1971, William Riley, former director of AEC security, wrote in a memorandum that Dr. Shapiro reported to Riley that he (Dr. Shapiro) had been told by officials of the government of Israel that an

unnamed AEC Commissioner had suggested to representatives of a foreign government that Dr. Shapiro had been involved in diversion of materials to the Israelis.

We know now that some high level officials of the CIA believed there was evidence of a diversion. Former NRC General Counsel Peter Strauss is reported to have said following a CIA briefing at the NRC that he "... got the impression that the CIA had a fairly strong belief that the inventory discrepancy represented material taken to Israel. He said that if the CIA's information was accurate, there was a strong circumstantial case--missing material, motive and opportunity." At a meeting of NRC Commissioners on November 12 of this year, Commissioner Gilinsky stated that he had told Mr. Gossick, with respect to the CIA briefing at the NRC, that "... the one thing that I felt was significant that should not be set aside easily, was the fact that whatever the fact, the CIA seemed to be convinced of the fact something had occurred there, that there was a diversion."

I would also like to note for the record that earlier this month we received from NRC Chairman Hendrie, the Commission's view that:

"... there are many people familiar with the information on this subject (i.e. Apollo/NUMEC) who seriously suggest a diversion occurred, and they have arguments that do have substance. We have seen no hard proof, one way or the other, but there are various circumstantial items that

keep the question unanswered."

Given that allegations about a diversion necessarily affect the reputations of those who were in charge of NUMEC, we have believed it important to ask Dr. Shapiro, as NUMEC's former president, whether he might wish to provide information on this matter which would help resolve, either by stilling the suspicions that exist, or shedding light otherwise.

We are aware that the investigations of this Committee could intrude upon the privacy of Dr. Shapiro. We believe, however, that the seriousness of the allegations has required us to pursue this matter as far as we can, making every effort to be fair and open.

I would say, in addition, that if there had been more openness over the years both by NUMEC with regard to conceding its losses, and the AEC in admitting the true nature of the situation, much of the current suspicion might have been put to rest long ago.

We have agreed that this hearing would be held informally, with the attendance of myself, Representative Baumen, our staffs, Dr. Shapiro and his attorneys. Because of the informality of the hearing, Dr. Shapiro will not be put under oath; we will have a transcript and a recording of the hearing which will be provided to Dr. Shapiro as soon as they are available. At that time Dr. Shapiro will be permitted to insert into the record whatever

supplemental or clarifying material he feels is necessary to present the facts as he sees them. We plan, at the conclusion of our inquiry, to turn over all our documents to the Department of Justice.

It is important to me that Dr. Shapiro not feel coerced or intimidated in any way. If he chooses not to address any question put to him this afternoon, he will not be pressed further on that issue.

Bob Terrell, does Congressman Bauman have any preliminary remarks to make?

Mr. Terrell. No, he doesn't, Mr. Chairman.

Chairman Udall. Do you wish to respond, Abe, to this?

Mr. Krash. Not at all, Congressman.

Chairman Udall. All right. Let me get involved in the questions, then.

Dr. Shapiro, NUMEC was founded in 1956, 1957, somewhere in that period.

Dr. Shapiro. 1957.

Chairman Udall. What was your role in getting the company started?

Dr. Shapiro. I was responsible for organizing it.

Chairman Udall. You were one of the original organizers of the corporation.

Dr. Shapiro. Yes.

Chairman Udall. You had been employed just previous to that

at Westinghouse?

Dr. Shapiro. Yes, I was.

Chairman Udall. Doing what? What were your duties?

Dr. Shapiro. I was at Bettis, the Bettis laboratory operated by Westinghouse.

Chairman Udall. Just basically and generally, what was the motive and purpose in establishing NUMEC?

Dr. Shapiro. I wanted to own a business for myself.

Chairman Udall. Okay. And can you tell us something about the stockholders and the incorporators, who the main investors were, and so on?

Dr. Shapiro. Initially the investigators were private investors. I believe there were about 25 of them, and the funds were raised by -- through the Apollo Steel Company, and I believe they owned somewhere in the neighborhood of 30 percent of the stock initially.

Chairman Udall. Apollo Steel had 30 percent of the stock?

Dr. Shapiro. I believe that is correct.

Chairman Udall. Did you personally invest any money in the operation?

Dr. Shapiro. No.

Chairman Udall. Can you give me the names of the two or three other principals, or four or five major principals that had invested besides Apollo Steel and anybody else?

Dr. Shapiro. There was an automobile dealer, Katanning, or

something like that. I believe it is all on record.

Chairman Udall. Okay. This isn't a vital point, but I had a question on it, and I thought maybe you could remember two or three of these people. Did the automobile dealer and others have their own money invested, to your knowledge?

Dr. Shapiro. Yes.

Chairman Udall. Substantial amounts? Could you give us a ballpark figure?

Dr. Shapiro. I really don't recall. The total investment at that time was, I believe, \$250,000.

Chairman Udall. Did you receive stock for your expertise and management ability that you were going to devote to the company?

Dr. Shapiro. I received some stock, yes.

Chairman Udall. Do you remember roughly how much, without going back to the records?

Dr. Shapiro. I don't recall what the initial number of shares were because they were split, and I just don't recall the actual numbers.

Chairman Udall. In the ballpark figure, would these people have a few hundred dollars, or few thousand dollars? Was it in that range?

Dr. Shapiro. It was in the thousand-dollar investment category. There were, as I said, about 25 all together, as I recall it, and Apollo was the principal through which the

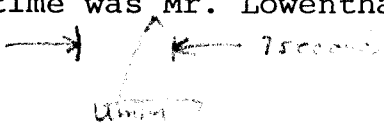
investment was made.

Chairman Udall. And did you go out and recruit the individual investors yourself? How did the group come together?

Dr. Shapiro. I helped to recruit some of them, but they were principally investors in Apollo Steel, as I recall it.


Chairman Udall. Who was the main person in charge of Apollo Steel?

Dr. Shapiro. The president at the time was Mr. Lowenthal, I believe.



Chairman Udall. And who is he?

Dr. Shapiro. He was --



Chairman Udall. A businessman?

Dr. Shapiro. A businessman.

Chairman Udall. Had you had prior connections or business dealings with him?

Dr. Shapiro. I had met -- no, I never had any business dealings with him, but I had met him through organizational work.

Chairman Udall. We have the name in the materials we have looked at of Raychord Corporation. Was Raychord Corporation connected with Apollo Steel?

Dr. Shapiro. Raychord was, I believe, a subsidiary of Apollo Steel, but it was formed subsequent to NUMEC's formation.

Chairman Udall. Did you already have lined up in prospect government contracts when you formed NUMEC, or were you forming the corporation and then looking about for business?

Dr. Shapiro. Right.

Chairman Udall. The latter?

Dr. Shapiro. Yes.

Chairman Udall. Okay.

Can you tell us whether or not there were any foreign investors, or whether any foreign governments, including specifically the government of Israel, directly or indirectly was an investor in NUMEC?

Dr. Shapiro. Absolutely not.

Chairman Udall. You are certain of this?

Dr. Shapiro. I am positive.

Chairman Udall. This was local money, money of 25 or so investors, plus Apollo Steel?

Dr. Shapiro. Right.

Chairman Udall. They were the only funds that went into this to your knowledge.

When NUMEC got underway and founded the company, did you have a plant building assigned, equipment, or were you starting from scratch with vacant property?

Dr. Shapiro. No, Apollo Steel had a vacant building, a shipping and receiving building, and we occupied that, and we also occupied the top floor of the office across the street.

Chairman Udall. How soon was it before you began to get active contracts for the company?

Dr. Shapiro. I really don't recall.

Chairman Udall. Fairly quickly?

Dr. Shapiro. Fairly quickly.

Chairman Udall. Months?

Dr. Shapiro. Months.

Chairman Udall. A few months after you were organized?

Dr. Shapiro. Yes.

Chairman Udall. Was the company formed with the idea of getting processing contracts with the AEC or the Federal Government to handle uranium and nuclear materials? Was this one of your objectives?

Dr. Shapiro. The principal objective was to get into the business of preparing fuel for power reactors, and we took other business to further our objectives in this because that business was at a low rate at the time.

Chairman Udall. You were recognized in those days as an outstanding expert in this field. Were there others in the organizational group that had expertise, or were they simply investors looking for a good business investment?

Dr. Shapiro. No, they had -- the people in the community, you mean?

Chairman Udall. The original investors, incorporators and businessmen, when you put NUMEC together, were you the one person with expertise in this field?

Dr. Shapiro. As far as the business people were concerned, they had no expertise at all. As far as those of us who started

the organization, we all had expertise in one aspect or another, except for the attorney that was also one of the few original members.

Chairman Udall. Do you remember his name?

Dr. Shapirol Gray.

Chairman Udall. "Ray?"

Dr. Shapiro. Gray.

Chairman Udall. Oh, Gray. All right. In the Pittsburgh area?

Dr. Shapiro. No, he came from Washington.

Chairman Udall. Did you have an adequate capital base to begin original operations with these original contracts just from your stock sales, or did you go out and borrow money, make loans, in order to get a capital base?

Dr. Shapiro. Yes.

Chairman Udall. From whom?

Dr. Shapiro. Primarily from the Potter Bank.

Chairman Udall. That is a Pennsylvania institution?

Dr. Shapiro. Pittsburgh institution, yes, which was later merged into other banks.

Chairman Udall. Do you have a general idea of the magnitude of those initial loans we are talking about -- a few thousand, or a million?

Dr. Shapiro. Approximately a quarter-million.

Chairman Udall. And was this money secured in any way?

Dr. Shapiro. It was secured against equipment that we purchased, for the most part.

Chairman Udall. Can you tell us whether any foreigners, foreign governments, anyone outside your group, was involved in making the arrangements for that loan, or those original loans that helped finance your business?

Dr. Shapiro. There were none.

Chairman Udall. There were none. I think I have already asked this, but I want to make clear that to your knowledge the government of Israel was involved in no way in the original founding of the company.

Dr. Shapiro. Absolutely not.

Chairman Udall. Or in getting the loans that got the company underway?

Dr. Shapiro. Absolutely not.

Chairman Udall. All right, sir.

NUMEC, your connection with NUMEC lasted what, 10 years or so? You left NUMEC when?

Dr. Shapiro. In 1970.

Chairman Udall. So we are talking about a 13-year, roughly, 13-year period?

Dr. Shapiro. Yes.

Chairman Udall. Give or take. During that time, what proportion of NUMEC's revenues and overall workload was involved in government contracts, and particularly the naval reactor program? Can you specify in general terms?

Dr. Shapiro. I really can't give you a -- it would just be

conjecture on my part at this point.

Chairman Udall. Less than half, or more than half?

Dr. Shapiro. I really don't remember.

Chairman Udall. But you did have a number of contracts, and not just the processing of naval reactor fuel?

Dr. Shapiro. Yes, we did.

Chairman Udall. Can you give me a general idea of what the other kinds of functions NUMEC had, what other kinds of contracts you had?

Dr. Shapiro. Well, we processed a lot of reactor-grade material. We were one of the principal fabricators of uranium oxide for power reactors. We also made hafnium crystal bar for control materials, and for other purposes, and we made neutron sources and radiation sources and burnable poison materials, and did scrap recovery both for ourselves as well as for customers.

Chairman Udall. Some of your customers, I take it, then, were government agencies and some were private?

Dr. Shapiro. Some of our customers were government agencies and others were private firms, yes.

Chairman Udall. To what extent with regard to the Navy fuel processing program were you their sole supplier? Were you competing with other firms?

Dr. Shapiro. We were competing with other firms.

Chairman Udall. Many of them, or where there just a few of them in this business in the '50s and '60s?

Dr. Shapiro. There were quite a few compared to the business that was available.

Chairman Udall. Do you know Admiral Rickover?

Dr. Shapiro. Yes.

Chairman Udall. Did you ever have any controversy with him at NUMEC? There are some suggestions in all of this that Rickover was very unhappy with NUMEC's performance, which may not be surprising given Rickover's personality, but did you have --

Mr. Krash. Have you ever known him not to be unhappy with somebody's performance?

Chairman Udall. Have you had any conflicts with him, or did you have during that period?

Dr. Shapiro. Yes.

Chairman Udall. What did they regard, quality of work, or --

Dr. Shapiro. No, they did not generally -- they were not generally with regard to the quality of our work. It was with regard to the price and with regard to other contractual issues.

Chairman Udall. Did he ever come to NUMEC; did you meet with him in Washington from time to time?

Dr. Shapiro. He never came to NUMEC.

Chairman Udall. And your --

Dr. Shapiro. My meetings with him were prior to -- except in one instance -- were prior to my coming to NUMEC.

Chairman Udall. Let me leave all this for a moment and hit

something that I think is very direct, very fundamental, here. As you know, one of the charges that is kicked around, suspicions in the conversation over the years, has been that you were involved in diversion, may have been involved in diversion, of enriched uranium to Israel or some other country. Were you?

Dr. Shapiro. No, absolutely not.

Chairman Udall. And so I don't leave any loopholes, I am talking about not necessarily direct to Israel, but to agents of that country, to third countries who you understood were going to divert to Israel, anything of this kind?

Dr. Shapiro. I never diverted any material to anybody.

Chairman Udall. Do you know of anyone else who did?

Dr. Shapiro. No, I do not.

Chairman Udall. You are unaware of any other arrangement. Did you ever hear of any other scheme or plan of anyone else to use your plant or facilities, to divert to Israel, or any other source, enriched uranium?

Dr. Shapiro. No.

Chairman Udall. Would you like to speculate -- this may be the kind of question you don't want to answer, why have these -- this has bothered me -- why have these rumors been so persistent these last 15 years?

Dr. Shapiro. I can only speculate.

Chairman Udall. I am trying to get an understanding. Clearly, this doesn't call for factual information on your part.

If you want --

Dr. Shapiro. You mean what have been the motives of these people?

Chairman Udall. Yes. Why is this thing so persistent, in newspaper reports, the memos back and forth between government agencies? Do you have any information?

Dr. Shapiro. First of all, congressman Udall, I don't believe they were persistent over the 15 years. They have been persistent over the past couple of years, I think, and I can only speculate as to why this whole matter arose again quite recently.

I believe there were probably two reasons. One, that it was a means of those who wished to demonstrate that nuclear power should be abandoned because of the possibility of diversion; and the other I believe, was because it suited some people, also, to use this as a means of embarrassing Israel.

Chairman Udall. Do you feel that you have been unfairly and unjustly treated in all of --

Dr. Shapiro. Absolutely.

Chairman Udall. -- in all of these allegations?

Dr. Shapiro. Absolutely.

Chairman Udall. All right. Let me turn to something else.

There is a memo, Feb. 27, '62, and most of these memos I am referring to are documents or things that we furnished your attorneys. If you are unfamiliar with them, I will try to do

something about it, but let me refer to one dated Feb. 27, '62, an Atomic Energy Commission memo from J. A. Waters, Director of Security, to Austin Betts, Director of Military Applications, indicating that NUMEC served as technical consultant and training and procurement agency for Israel in the United States. The memo also states that under this agreement one Israeli metallurgist worked at NUMEC's plutonium plant. Was there such a metallurgist, and do you recall his name?

Mr. Becker. Let me say that we don't have a copy of that document. If you have a copy, we could look at it.

Chairman Udall. Let me say by way of preface that I have been through a whole mound of materials myself.

Mr. Krash. What was your question, Congressman Udall?

Chairman Udall. Was there an Israeli Metallurgist and what was his name?

Dr. Shapiro. His name was Dr. Bernard Cinai.

Chairman Udall. Can you spell that?

Dr. Shapiro. C-i-n-a-i. He worked at the plutonium facility.

Chairman Udall. At Apollo?

Dr. Shapiro. In Parks Township, not at Apollo.

Chairman Udall. What was that facility?

Dr. Shapiro. That was the facility located about six miles down the road from Apollo in which we were working on the development of fuel for, plutonium-bearing fuel for power reactors.

Chairman Udall. What was the connection of that concern company, to NUMEC?

Dr. Shapiro. It was part of NUMEC.

Chairman Udall. This was a subsidiary or ---

Dr. Shapiro. It wasn't a subsidiary. It was just a separate operation.

Chairman Udall. A separate operation. I am going to come back to him in just a moment, but in your years at NUMEC were there other Israeli citizens that worked as technicians

in your facilities?

Dr. Shapiro. Not that I know of.

Chairman Udall. He is the only one that comes to mind?

Dr. Shapiro. The only one that I know of that worked in our facilities.

Chairman Udall. Given the sensitive nature of the materials you were handling and so on, why was an Israeli citizen hired for this job as against a U.S. citizen?

Dr. Shapiro. Well, this was done under -- with the knowledge of and permission of the Atomic Energy Commission. It was done under the Atoms for Peace program, and part of that program was for the training of personnel and this man was, as I say, a part of that program. He was, without question, an outstanding technical person.

Chairman Udall. So you advised AEC or asked their consent to employ him at the plant?

Dr. Shapiro. Yes.

Chairman Udall. What was the procedure? Was this a written kind of procedure?

Dr. Shapiro. I believe it was written, but I can't recall at this point, but it was certainly done with their knowledge and consent without question.

Chairman Udall. And he came to the United States specifically for the purpose of ---

Dr. Shapiro. Working at that facility.

Chairman Udall. Working at that facility and learning and getting expertise and getting information about the peaceful uses of plutonium and nuclear power?

Dr. Shapiro. Of plutonium and nuclear power, exactly.

Chairman Udall. And he is the only Israeli technician you have said that you recall in your years at NUMEC ---

Dr. Shapiro. Right.

Chairman Udall. --- which came there for that purpose?

Mr. Krash. If I could interject. I don't want to interrupt at all, but I would like to invite your attention to the fact that in the prepared statement, which I know you have not had a chance to see, Congressman Udall, at pages 7 and 8 we have listed the names of various individuals who were foreign nationals who worked at NUMEC. There was a Dutchman from South Africa, there were some Argentinians and there were some Japanese. In other words, there were a number of foreign nationals who were working there, about half a dozen actually, and they are all listed there.

Chairman Udall. They were here for the same purposes and same reasons?

Dr. Shapiro. No.

Chairman Udall. What was the difference?

Dr. Shapiro. The Japanese were there for the same purpose. The Dutchman was employed as an instrument expert. The Argentinians were analytical chemists who were working at our

plutonium facility, as I recall it.

Chairman Udall. And these also were Atoms for Peace, helping to train other countries?

Dr. Shapiro. These were people who had gotten their degrees at the University of Pittsburgh, if my memory serves me correctly.

Chairman Udall. And would they typically seek you out and seek employment or were you looking for these kinds of people?

Dr. Shapiro. We were looking for analytical chemists.

Chairman Udall. And national origin was not of great concern so long as AEC would approve?

Dr. Shapiro. Right.

Chairman Udall. Mr. Cinai particularly, what was the nature of work that he performed and how long was he there? Do you recall?

Dr. Shapiro. He may have been there about 12 or 14 months and his specific project was on the degree of homogeneity achieved in the mechanical mixing achieved in the mix of uranium oxide and plutonium oxide for the purpose of making homogeneous mixed oxide for ---

Chairman Udall. Nuclear fuel rods?

Dr. Shapiro. For nuclear fuel rods.

Chairman Udall. Did he seek you out or did you seek him out? Do you recall the circumstances of his employment?

Dr. Shapiro. I don't recall specifically how that came about.

Chairman Udall. Over the years I suppose the work force varied from time to time, but during that 13-year period typically how many employees would you have total at NUMEC in all your different operations?

Dr. Shapiro. In all the different operations I think we peaked at 1,000.

Chairman Udall. And it was lower than that from time to time?

Dr. Shapiro. Yes.

Chairman Udall. Yes. The kind of work that Mr. Cinai was doing and I guess I would apply that to these other foreign nationals, was this an opportunity to gain expertise that could have been applied in nuclear weapons programs?

Dr. Shapiro. Not that I can see at all.

Chairman Udall. The tasks he was doing, the technology involved was ---

Dr. Shapiro. The technology was ---

Chairman Udall. --- specific to ---

Dr. Shapiro. --- was with uranium and plutonium oxides, specifically with regard to the fabrication of fuel elements for power reactors.

Chairman Udall. Would it be a fair summary with regard to these people -- and I am talking now about various foreign nationals -- that you are not aware of any information or

anything that came to your attention over the years that these people were trying to acquire information that might be helpful to them in a nuclear weapons program, particularly Israel's nuclear weapons program?

Dr. Shapiro. I certainly didn't give them such information.

Chairman Udall. I am going to refer now to an October 15, 1964 letter from Keller of the AEC, Oak Ridge, to you, Dr. Shapiro, in which he states that "A crossover between different jobs has occurred."

My first question is, this terminology, does this mean that materials assigned to one contract, nuclear materials assigned to one contract were mixed with materials from other contracts? Is that what you understand that allegation to cover?

Dr. Shapiro. If I could take a minute.

Chairman Udall. Sure, take your time.

Dr. Shapiro. I presume that he was referring to a job in which we had permission from the Atomic Energy Commission to utilize material from one contract which had been deferred for some reason and for which material was on hand be used in another and which permission, this permission was gotten from a New York operations office and apparently there was some misunderstanding and as a result communication with, as I understand it, Washington Headquarters, that was later

rescinded and at the time that it was rescinded we stopped doing it.

Chairman Udall. In general your relationship, contractual relationship, with AEC was such that when you had material on one project, it was a violation of the contract for you to use that material in connection with some other project or contract. Is that what he refers to here?

Dr. Shapiro. There were two kinds of material. One was the leased material which we simply leased for the purpose of doing whatever jobs. Then there were specific contract materials and the specific contracts may have had on occasion a provision which indicated that that material should not be used for other materials, depended entirely upon the materials of the contract.

Chairman Udall. Some did permit crossover, some did not permit crossover?

Dr. Shapiro. I just don't recall.

Chairman Udall. All right. I am going to refer now to what is referred to in many of these materials as the WANL contract, which I take it is Westinghouse Astronuclear Laboratory?

Dr. Shapiro. Yes.

Chairman Udall. Can you describe briefly what that contract involved? What were they sending you and what were you doing with it?

Dr. Shapiro. They sent us uranium hexofluoride, which

is a gaseous material which we got in cylinders from the diffusion plants. That was converted into a compound, uranium carbide, which was in a particular form of little spherical particals as large as essentially flyspecks, which had very stringent specifications associated with them from the standpoint of chemical composition, from the standpoint of size and distribution, and from the standpoint of density and sporicity, and ---

Chairman Udall. What was the end-use of these particals?

Dr. Shapiro. These were to be used in the fuel elements which were eventually fabricated by WANL.

Chairman Udall. For the Navy? For commercial fuel?

Dr. Shapiro. No, no, for the Nerva program, which was a nuclear rocket.

Chairman Udall. Now, this WANL contract, was that one in which crossovers were not permitted?

Dr. Shapiro. Yes.

Chairman Udall. Under that contract you had no right to use those materials in connection with any other contract that you were operating under?

Dr. Shapiro. As I recall it.

Chairman Udall. All right.

Let me ask you then the obvious question: Was any of this WANL material to your knowledge ever used to satisfy obligations associated with other contracts?

Dr. Shapiro. If it did occur, it occurred only in an accidental way and in scrap recovery. Now you have got to understand what scrap recovery entails.

Chairman Udall. I would like to.

Dr. Shapiro. To recover scrap you must dissolve the material and then it must be put through a chemical extraction column, liquid extraction column or columns, in fact. It is dissolved in a highly corrosive acid. It is then put into these columns where it mixes with an organic material and there is a partition that occurs such that the pure uranium goes into one phase and the impurities go into another phase. This material then comes out as uranyl nitrate, which is a uranium material which is insoluble. It must then be precipitated to form a solid, which was generally done with ammonia, and filtered, dried, and subsequently decomposed and then reduced to the uranium oxide form.

There were a number of steps. Now, in the process of extracting the material it is necessary to fill the pipeline, so to speak, and to get an equilibrium established within those columns. And it is under those circumstances that you get the proper partition of the impurities and the uranium.

It was essentially not only impractical, but impossible to take small quantities of material and put them through and segregate them and put them individually through those columns and achieve and maintain equilibrium. Therefore, the

procedure that was involved was to dissolve the material, to assay that material, put it through -- in other words, to establish the quantity, put it through and then to segregate a portion of the material coming through, depending upon what the assay is, make an estimate of what the losses in processing were, and ---

Chairman Udall. Allocate?

Dr. Shapiro. --- and allocate that material to that particular contract and so it went.

Chairman Udall. Uh-huh. So in that sense there may have been some mixing of WANL contract material, but only in the scrap recovery process that I hope you don't ask me to ---

Dr. Shapiro. That's right.

Chairman Udall. --- explain again.

I think I understand enough about it to ask questions, but that is about all.

Do you understand that your WANL contract permitted that kind of mixing? That this was a violation of AEC regulations or the WANL contract itself? Did they know you were doing this kind of thing? Did you do this ---

Dr. Shapiro. I am sure they knew that we were doing it because eventually -- I don't remember when the supply agreement was put into place, but the AEC recognized the necessity of doing it that way and adjusted their contractual arrangements

to allow for that to happen in recognition of that fact. In general we were doing work on scrap recovery as it was being done, as we understood it, at the Oak Ridge National Laboratory. And I believe it was my understanding that they followed a similar procedure. So it was certainly not unknown to the AEC.

Chairman Udall. And you feel you didn't violate your contract in scrap recovery with procedures of this kind?

Dr. Shapiro. There may be some who felt that we were violating it, but I believe that those who understood the practical aspects of the situation recognized the necessity for doing it that way. Otherwise, the losses would have, in fact, been considerably greater because it would have entailed disturbing of the equilibrium in the columns. You would be putting it through, establishing equilibrium and the material coming through first would be no good and the material that came through last would be no good. That would then have to be put back.

We would then have to clean up the columns between each one and under those circumstances obviously the losses that would have been incurred would have been greater in processing than they would have under these circumstances.

Chairman Udall. Okay. One of the things that has been kicked around by those who are suspicious is the suggestion that you were paying off old -- that some kind of diversion

or loss had been going on and that you would pay off old contracts by material from new contracts like running checks around to different banks, that you were doing this kind of thing and a lot of attention has been paid to this WANL contract.

Can you tell us that you never engaged in that kind of a procedure with regard to this contract and that WANL material was not used to pay off obligations on old contracts?

Dr. Shapiro. It became evident during the course of this contract that our losses were greater than we had estimated and, therefore, the amount that we had allocated to each contract and shipped back to the customer was greater than it should have been based on the actual losses that did occur versus those that were estimated.

Is that clear?

Chairman Udall. Yes, I think I follow.

Dr. Shapiro. And, therefore, the only way that could have happened is that material which should have been charged to a subsequent batch was charged to the former batch and in that sense it could have happened.

Chairman Udall. But you don't see anything devious or sinister about ---

Dr. Shapiro. Absolutely not.

Chairman Udall. --- about this operation?

I am about to leave this, Henry, and it is very clear

in my mind. I don't want to come back to it if -- all right.

Mr. Krash. I hope you will feel free to ask any questions here that -- pursue any questions that you want to.

Chairman Udall. All right. I want to go through and do it just as quickly as possible and thoroughly as possible. If you have questions on items I have not clarified, whisper in my ear or speak up. Do you have anything to this point that is major?

Mr. Myers. No.

Chairman Udall. Let me move to another topic. I am going to be talking about section 6.13 of the AEC survey report conducted in November of 1965. I think you refer to that in the brief that your attorneys submitted to us sometime ago.

The AEC survey report says something like this -- it is just a paragraph: "In an attempt to establish yields and loss mechanisms directly applicable to this purchase order, the survey team requested NUMEC production control and process engineering data on this and other contracts. The data made available was of little or no value in this regard. Process lots or batches could not be correlated to points in time nor could a sequence of processing events be established. All efforts in this direction were negated when it was learned that many of the requested records had been inadvertently destroyed by supervisory personnel during a cleanup campaign

at the time of an employee strike January 1 to February 25, 1964.

I wanted to ask several questions about that set of allegations.

Tell me about this strike. Was it an actual work stoppage?

Dr. Shapiro. It was a very severe, serious strike that we had. It lasted, as I recall, for over two months.

Chairman Udall. Did it involve all your employees except for supervisory people?

Dr. Shapiro. It involved all the employees in the Apollo plant except the supervisory personnel and it occurred in the dead of winter, around the Christmas-New Year's period, as I recall it, and into January and February.

Chairman Udall. When you are handling nuclear materials, does a stoppage of this kind cause any danger or particular problems for you? Can you shut down the operation without hazard?

Dr. Shapiro. Yes, you could shut down the operation without hazard.

Chairman Udall. Was there any violence connected with this strike?

Dr. Shapiro. There was violence.

Chairman Udall. Of what nature?

Dr. Shapiro. Some of our equipment was tampered with. For example, one of the trucks had sugar poured into its gas tank. The brakes of one of our supervisory employees were

cut; that is, the hydraulic lines were cut.

Chairman Udall. Yes.

Dr. Shapiro. This fellow could have, in fact, been killed because, as you know, we live in a hilly area and this man's car was located on a hill.

I was assaulted, et cetera.

Chairman Udall. Okay. What can you tell us with regard to this statement here that the records they were trying to get to trace these various batches were inadvertently destroyed by supervisory personnel during a cleanup campaign? Did the cleanup campaign occur because of the strike or have connection with it? What can you tell me about destruction of these records?

Dr. Shapiro. First of all, the records were not destroyed per se, okay? I can explain that. These were discarded by the people who were doing the cleanup, not because I had ordered it, but because they had decided they were cluttering up the area of the files and that they were no longer necessary and there was no necessity for retaining them. They were production-type records. They had nothing to do with SNM control per se.

Chairman Udall. Give me an example. When you run a batch through or process a batch ---

Dr. Shapiro. We have to give our employees instructions for ---

Chairman Udall. I see.

Dr. Shapiro. --- what they are to do and when they are to do it, et cetera. And these were processing and manufacturing instructions.

Chairman Udall. You had been in business for seven years at that time. You had an accumulation of these old things, is that what you are telling me?

Dr. Shapiro. Yes.

Chairman Udall. But none of these were of the kind of records that would help us to identify a MUF or a ---

Dr. Shapiro. I don't believe that they were at all relevant to the situation, and Mr. Lovett, whom I talked to subsequently, felt that they had no relevance either. They were just grabbing at straws.

Chairman Udall. Did you indicate that your personnel destroyed --- cleaned them out, got rid of them, without your instructions on their own initiative?

Dr. Shapiro. Yes. The point was that during the strike supervisory personnel operated the plant to the best of their ability. I felt it was appropriate and desirable to clean up and maintain the plant during that shutdown, which they in fact did. And during the course of this the supervisory personnel in charge of production decided that these were no longer necessary to be kept and there was no need to keep them for any -- we were not obligated to keep them for any

reason and that they were not relevant to anything we were doing at that time.

Consequently, they discarded them.

Chairman Udall. Wouldn't it have been customary or was there any requirement that you know of that you report the discarding of these records to AEC or anyone?

Dr. Shapiro. No. There was no necessity for that because they were internal production and processing type records, and those records which we were obligated to keep for governmental or other purposes were always kept.

Chairman Udall. How would you respond then to this statement, and I will just read a part of it, process lots or batches could not be correlated to points in time nor could a sequence of processing events be established?

You are saying that five years after you processed something it is unimportant to anybody any more, the exact order or sequence in which you carried on an operation? Is that essentially what it is?

Dr. Shapiro. I would assume that this is what they had in mind, but I -- really not having written this, I really don't ---

Chairman Udall. I am not blaming you for their report, but I am trying to find out what it was they were complaining about, because they apparently took the loss of these records as being of some consequence.

Let me pursue that just a moment.

The brief you submitted to us at page 36 says that the lost records would not have been substantially helpful in determining the causes of material losses and you have just repeated essentially that to me today.

Dr. Shapiro. Yes.

Chairman Udall. The statement in the AEC survey that I just read seems to suggest otherwise, namely, that the survey team believed the records would have, in fact, been useful. I guess you have already commented on that conflict.

Dr. Shapiro. Yes. As a matter of fact, as I said, Mr. Lovett who was responsible at that time for one of those who were engaged in the survey, felt that they would be of no use.

Chairman Udall. Do you have any knowledge of in what form the discarding took? Was it burning or shredding?

Dr. Shapiro. I really don't know.

Chairman Udall. What did you typically do with your waste paper?

Dr. Shapiro. Dumped it in the garbage, I guess.

Chairman Udall. But there was no particular procedure for these kinds of records to shred them or burn them or take precautions of that kind?

Dr. Shapiro. [Shaking head.]

Mr. Krash. If you shake your head, it doesn't show up

on the reporter's transcript. You have to say something.

The answer was "no," I take it?

Dr. Shapiro. No.

Chairman Udall. There was some reference -- I can't remember what it was -- of a fire that destroyed some records. Was this the only incident where records were discarded? Do you remember anything about a fire at the NUMEC plant?

Dr. Shapiro. We had a fire in our storage vault and there may have been some -- I don't recall, there may have been some involvement of paper at that time, but because we kept records of our storage in the vaults, since the man who had responsibility for incoming and outgoing material had to keep the records there ---

Chairman Udall. This was the same vault in which you kept nuclear material?

Dr. Shapiro. Yes.

Chairman Udall. And the records related to them?

Dr. Shapiro. And it was a nuclear storage vault.

Chairman Udall. And the records relating to them were also, sometimes also kept in the vault?

Dr. Shapiro. Yes, and the important thing to recognize is that uranium carbide is a pyrophoric material. This is a material then that can spontaneously burst into flame.

Chairman Udall. Can you tell us about when that fire was?

Dr. Shapiro. I will guess around 1963 or thereabouts.

Chairman Udall. It was not connected with this strike that I referred to earlier?

Dr. Shapiro. No.

Chairman Udall. Now you think some records were destroyed in that fire that would have been of more consequence than the kind of batch processing records I was talking about a moment ago, would you?

Dr. Shapiro. Frankly, I don't remember whether there were any records involved at that time. I do remember that there was material involved and that what we had to do was to come in with special fire extinguishers that we had to use, and I just don't know whether there were, in fact, any records involved in that that might have been destroyed as a result of that fire.

Chairman Udall. Well, I had here that NUMEC notified AEC of the loss of records but not until 1966, which apparently was a couple of years or so after you had the fire in the vault.

Is there anything sinister or suspicious about that?

Dr. Shapiro. Nothing in my mind.

Chairman Udall. Would you ordinarily -- the kinds of records that the AEC required you to keep, had they been destroyed, would this have been an event that you would have been required to communicate with AEC on ordinarily?

Dr. Shapiro. If this were something which we were required to communicate with the Atomic Energy Commission, we would have, in fact, done so because we always tried to do what was required by regulation.

Mr. Terrell. Mr. Chairman, could I ask a question?

Chairman Udall. Sure.

Mr. Terrell. With regard to these records, were there any records that you kept proprietary in nature since you were dealing with Government and outside the Government, in the private sector, that would have been something

that you would want to safeguard for the benefit of the contract?

Dr. Shapiro. Not for storage purposes. Not for materials storage purposes.

Mr. Terrell. I mean production records that we are addressing. Would there be anything in there that would be of a proprietary nature?

It would seem to me that their treatment, something of that nature, would be something greater than casual. In other words, you just wouldn't throw them out because they were excess in the everyday average trashcan if they were proprietary at that time?

Dr. Shapiro. You are talking about discarding of the production records?

Mr. Terrell. Yes.

Dr. Shapiro. I really don't know of anything that would cause us to treat them in any special way.

Mr. Terrell. Thank you, Mr. Chairman.

Chairman Udall. To return -- maybe I can conclude this to the fire in the vault which you said was roughly in the '63 time frame, you can't recall now whether there were or were not any records destroyed?

Dr. Shapiro. I don't know.

Chairman Udall. You are saying there could have been the fact that we discussed, some were kept there at some time?

Dr. Shapiro. There were records kept there.

Chairman Udall. And if anybody is charging that you -- that there were actually records that were destroyed in that vault fire that you didn't report for two or three years, you know nothing of that phase?

Dr. Shapiro. I don't recall anything about that.

Chairman Udall. I am now going to refer and quote from an August 2 '65 memo to the Commission by AEC Assistant General Manager Howard Brown. I believe your attorneys have been furnished with this previously.

Let me quote from that: "By the middle of July" --

Mr. Becker. Could we have just one second?

Chairman Udall. Sure.

Mr. Becker. This is signed by Brown, to the Commissioners?

Mr. Myers. Yes; Howard Brown. I think you have it.

Is it signed by Howard Brown at the end, the last page there?

Mr. Becker. We have another one with the same date.

Mr. Myers. I believe that's the one.

Mr. Krash. We have it.

Chairman Udall. I am quoting from that memo, Dr. Shapiro. He said: "By the middle of July the issue had not been resolved, and on July 21, members of the AEC staff" -- and we better close that door -- "members of the AEC staff met with Dr. Shapiro and members of his staff in his office at

Apollo to discuss the situation and to ascertain what steps might be taken to satisfy the interests of the company and the Government. Shortly after the meeting began, Dr. Shapiro disclosed for the first time a new source of waste material at the plant which, he averred, would not only make up the dollar difference on the WANL contract, but would result in AEC owing NUMEC. Dr. Shapiro stated this new source of valuable waste was contained in about 800 drums of Kleenex, Kimwipes, et cetera, buried under four feet of earth on the company property.

"We asked Dr. Shapiro why, in view of the numerous discussions and the almost daily contact on this matter for the past several months, he had not previously disclosed his estimate of the content of the material in the 800 drums. Dr. Shapiro simply said that the situation was embarrassing."

That is the end of the quote.

In meeting with the Commission on August 10, you, Dr. Shapiro, proposed that the buried material be recovered over a 12-month period. You indicated at that time that NUMEC would experience difficulties in excavating the material quickly. It appears that NUMEC was urged to undertake the excavation on a more expedited schedule than you proposed.

Dr. Shapiro eventually agreed, and exhumation was begun on October 11 and completed on October 21, 1965.

The exhumed material contained approximately six kilograms

out of the total of 52 kilograms missing.

So I guess what I want to ask you first is: What led you to be so firmly convinced in the first instance that these large quantities were actually buried in the disposal pile?

Dr. Shapiro. The fabrication of uranium carbide entailed a number of steps, and the material by nature -- because of the particle sizes that we were involved in -- was extremely dusty. It was necessary to, because of the pyrophoric nature of the material, to work in special atmospheric enclosures which had glass portholes.

In addition to that, there were lights inside to illuminate the work, and there were a number of pieces of equipment, and so forth, which were contained in these. It was necessary very frequently for the workers to clean off the surfaces of the portholes and equipment, and so forth, in order to continue operating. Those Kimwipes, rags, et cetera, plastic materials which were used to enclose certain things, accumulated this black uranium carbide material.

Chairman Udall. Uh-huh.

Dr. Shapiro. And these were then bagged and put in a drum and surveyed by our health physics man with an instrument, and it was his opinion, based on the survey, that the amount of material contained in these drums was really quite small and not worth recovering, so these were then buried.

When it became evident that our losses were greater

than we had anticipated during the course -- towards the end of the contract, I then became very concerned about where this material might have gone, and we looked for the various possibilities.

Among the things that I asked our people to do was to take these Kimwipes and go through representative procedure, and then I had these things ashed, so that we could concentrate and accumulate the material, and for the work that they did the average amount that seemed to accumulate per Kimwipe seemed to be approximately one gram.

Chairman Udall. So you extrapolated from that to the number of drums in the burial site?

Dr. Shapiro. Well, taking the number of Kimwipes that had been used over this period of time, I did just what you say; I extrapolated, and it appeared to me that we could have, in fact, accumulated a large quantity of material that had, in fact, been discarded by burial.

Chairman Udall. Why were you wrong on that? Did you get a bad sample, a bad cross-section?

Dr. Shapiro. I am not sure that I was entirely wrong. We did in fact -- according to the GAO report -- recover from the pits that we dug up, 7.4 kilograms of U-235, and, in addition to that, it was estimated as a result of sampling the earth from one of those pits that there was an additional 2.2 kilograms of U-235 for a total of almost 10 kilograms.

Chairman Udall. Were these drums metal?

Dr. Shapiro. The drums were metal. But some of the material was not put in drums, some of it was put in cardboard boxes.

Chairman Udall. Which had deteriorated?

Dr. Shapiro. Exactly. And in the process of digging this up, particularly during the period that this was done, we were in a rainy period, and as a matter of fact we had difficulty operating the bulldozer because of the character of the mud, much of this stuff was ruptured, and it was difficult to recover.

Now, it was my feeling on the basis -- first of all, you must understand that not all of the pits were dug up. I think I mentioned that previously.

Chairman Udall. Uh-huh.

Dr. Shapiro. It was my feeling that, in fact, that indicated that there was, in fact, considerably more material that had, in fact, been discarded in that way than we had estimated.

Chairman Udall. Do you then controvert the estimate that apparently the AEC and the other people, talking about six kilograms was all that they recovered, you feel there was quite an additional and larger amount?

Dr. Shapiro. I don't controvert that, Congressman Udall. I am merely quoting from the GAO report which was subsequent to that report, by which time we had, in fact, recovered all

of the material that had been exhumed from the pits, and their number was 7.4 kilograms, and the amount of material that was estimated to have leached into the soil from that particular pit was 2.2 kilograms.

Chairman Udall. So we could account then for 10, roughly 10 of the 50-some?

Dr. Shapiro. Ten of the roughly 50-some kilograms.

Chairman Udall. That were missing.

Is that your judgment that that is about all there was now in the pit, or do you think that you ---

Dr. Shapiro. I think there was more.

Chairman Udall. How much? Ball park -- would you care to make an estimate?

Dr. Shapiro. I really can't tell.

Chairman Udall. Considerably more?

Dr. Shapiro. I would say that there was considerably more by virtue of the fact that the conditions under which we exhumed the material were very difficult, and I am not sure that this was entirely representative, therefore, of what we could have gotten had it been done under more favorable conditions.

Chairman Udall. That leads me to the related question.

Some might see something sinister in the fact that you said this would take a year to do -- you were telling them it would take a year to do it and you wanted to spread it out and, in fact, they did

it in ten days, which would seem to suggest that you were not anxious to have this done and were delaying it.

Dr. Shapiro. My recollection, Congressman Udall, was that it took considerably more than ten days. I don't recall exactly how much it took.

Chairman Udall. Henry, where did we get this figure that the exhumation began on October 11 and was completed October 21? Do you recall?

Mr. Myers. It's this October 22, '65 letter.

Dr. Shapiro. That may have been one pit.

Mr. Myers. The AEC staff said the excavation in the '63 burial pit was begun on October 11th and Mr. Newman reported that on October 21 the excavation was 98 percent completed.

Chairman Udall. Was there a pit for each year?

Dr. Shapiro. There were a number of pits. I think he was referring to just one.

Chairman Udall. This says excavation of the 1963 burial pit; it's identified as the '63 burial pit.

Dr. Shapiro. Yes.

Mr. Myers. The impression from the documents is that's where it was expected that most of the material would be. Is that correct?

Mr. Becker. Just a moment, sir, so we can show him that document.

Does your copy say 1/23rd of the material exhumed?

Mr. Myers. Right.

Chairman Udall. Do they have this?

Mr. Myers. I think so, yes.

Dr. Shapiro. First of all, the exhumation actually started earlier than October, as I recall it. I believe it was in process for probably a couple of months prior to that time.

Mr. Myers. It said that in a meeting on September 24th, I think, that you said that -- this is a memo from APOLLO/NUMEC, dated September 30, 1965.

Mr. Becker. We do have it.

Dr. Shapiro. What do you --

Mr. Myers. In the first two paragraphs on page 4 it talks about the '62 pit.

Dr. Shapiro. I think it's obvious from this that the exhumation started before October.

Chairman Udall. Well, we have all been wandering around the documents. Do you recall suggesting it would take twelve months or so to completely dig up and burn and assay all of this material?

Dr. Shapiro. I don't recall that I said specifically twelve months, but I certainly felt that, in order to do this and do it properly under conditions that would allow us to recover the material properly, and to recover it through

the scrap recovery so that we could, in fact, determine how much was in it, would certainly take a considerable length of time.

Chairman Udall. Not a ten-day job?

Dr. Shapiro. By no means.

Chairman Udall. Would you agree -- the suggestion here in these documents is that you were looking for a place where you were going to find most of the material that might have been missing from the WANL contract which was highly enriched uranium, that the '63 pit was the obvious place?

Dr. Shapiro. I think I would agree to that, although material in the contract proceeded over a period of two-plus years, as I recall it.

Chairman Udall. The documents here reflect that one of the conversations with you was that while the '62 pit was most convenient, he admitted -- quoting you here on this same document -- that it would have been better from the standpoint of settling the WANL contract to have opened the '63 pit first. He stated that the '62 pit, however, did contain some material accumulated from the beginning of WANL and that he was encouraged that they had located some material in the 76-percent range.

Dr. Shapiro. Right.

Chairman Udall. He further stated that the '63 pit contains all of the remainder of material generated under the WANL contract. Does that sound right?

Dr. Shapiro. Not entirely because, as I recall it, the WANL contract was -- we had gone from '62 through '64, and possibly even some of '65, but I don't recall exactly.

Chairman Udall. Of the materials going through your plant, if I had wanted to get my hands on some stuff that was most useful in making nuclear weapons, was the WANL contract one of the most likely places I would have gone after, or were you handling, in other contracts, materials equally valuable?

Dr. Shapiro. We were handling other contracts that had highly enriched material, as I recall it, at that time.

Chairman Udall. But was this bigger than the others, the major source of that kind of material?

Dr. Shapiro. It was a large source.

Chairman Udall. Okay.

Henry, I am kind of "let's see" on this.

Do you have anything else on this subject, on the garbage pits?

Mr. Myers. No.

Chairman Udall. All right.

Let me turn to something else.

I am going to talk about contracts that NUMEC had, particularly foreign contracts. In briefing the Commission on February 14, '66, the AEC I am talking about, former Assistant General Manager Howard Brown stated that the data the AEC staff had on NUMEC's foreign shipments["] was based only

on NUMEC records that the present safeguards system did not provide for or require independent AEC physical checks of shipments."

Your brief, at page 40, submitted to us by your printers, suggested there were independent checks made on materials shipped from the NUMEC plant.

Let me ask you first, to get perspective here, how many in a typical year or month or some time frame, how many shipments would be going out of NUMEC to foreign contracts that you were fulfilling?

Dr. Shapiro. I really can't tell you specifically.

Chairman Udall. In the hundreds or a few dozen?

Dr. Shapiro. Oh, we had, as I recall it, a total of 30 foreign contracts, of which I think, there were only something in the 20's related to the shipment of special nuclear materials and only comparatively few of those pertaining to the shipment of highly enriched material.

Chairman Udall. Now, I think what we are talking about here is, when you got ready to make one of those shipments, was there any requirement that some outside person from AEC come by and physically check that shipment, or did you have authority to simply put it in a container and send it off?

Dr. Shapiro. I don't recall specifically. All I can recall is the following: That the foreign contracts were all with the knowledge, consent, concurrence of the Atomic Energy

Commission, because they involved the bilateral agreements between those countries involved whether it was France or Belgium or whatever.

And these arrangements were, therefore, made with the Atomic Energy Commission. The material was checked by a number of people in our own plant prior to going out, and I know that at least in some instances there were AEC people who were involved in the transfer.

As a matter of fact, I have a photograph of an AEC man with me next to a bird cage -- which was the container -- showing that shipment next to the French person who was accepting it.

Chairman Udall. But there was no ongoing requirement or procedure at NUMEC whereby some official from AEC had to come in and check a shipment before it went to one of these foreign contracts that you had?

Dr. Shapiro. I don't really recall. I don't think so.

Chairman Udall. I am trying to grasp what it was that was kind of the program you had ongoing there. How many foreign countries over the period of your association with NUMEC did you service?

A few? A couple dozen?

Dr. Shapiro. I think there were less than a dozen.

Mr. Udall, all of this is, in fact, a matter of record, and as a matter of fact I think Mr. Myers has a full, complete listing

of all of the shipments that were made and the times and the quantities and the enrichments.

Mr. Myers. Yes.

Chairman Udall. Okay. I don't want to get into a lot of great detail, but I was just trying to get some idea of the procedures.

What percentage of your business over the years was with Israeli firms or with the Israeli Government, the shipments which you made abroad?

Dr. Shapiro. Comparatively small. Are you referring to special nuclear material? Or are you referring to business in general?

Chairman Udall. I am referring to business in general at NUMEC.

Dr. Shapiro. Comparatively small.

Chairman Udall. They were not -- the Israelis were not your largest customer, you would say?

Dr. Shapiro. By no means.

Chairman Udall. You can't really recall or help me very much with regard to the procedure, whether AEC would come to your plant and verify different shipments? Sometimes they did; sometimes they didn't; but you can't --

Dr. Shapiro. At this time I can't recall. I am really sorry, but I would only be speculating as to that.

Chairman Udall. Is there any way that the AEC could tell

today or that this committee or anybody else could determine that highly enriched uranium was not shipped from NUMEC in containers that purportedly had other contents or low-enriched uranium?

How would we go about establishing this today? Do you have shipping records that would tell us?

Dr. Shapiro. There were certainly shipping records. These records were not only kept at NUMEC, but they were also, we were obligated to send copies of these records to the Government. They had their own set of records.

Chairman Udall. But the signature of your company and the shipping officials there is all the proof that we would have or the AEC would have that the carton contained what it says it contained?

Dr. Shapiro. I really don't know whether this is all of the proof. I suspect that there was more because I do know that in at least a couple of cases they intercepted shipments and sampled material and had them sent to the New Brunswick laboratory for analysis and consequently there must have been other means of determining --

Chairman Udall. This was AEC you are talking about?

Dr. Shapiro. Yes.

Chairman Udall. They would make spot checks from time to time, apparently?

Dr. Shapiro. Apparently. I really didn't know whether

they made spot checks from time to time or all the time.

Chairman Udall. But you know some of your shipments were intercepted and checked?

Dr. Shapiro. I do know in a couple of cases shipments were intercepted and checked.

Chairman Udall. Typically, maybe there isn't a typical case, but your shipping to France or Belgium nuclear materials, how would they go? Would they go by APOLLO, by truck? Do you call United Parcel? Do you put them on an airplane?

Give me, as a layman, an idea of how you would get a shipment of material you had processed to your customer in Belgium or France or wherever.

Dr. Shapiro. First of all, it's necessary to understand that when a shipment went out, any shipment went out, and particularly a foreign shipment went out, these were very carefully checked. They have to be packed in special containers, bird cages. They were checked by a number of people in the organization for, one, whether we had in fact fulfilled the order, terms and conditions of the order.

Secondly, whether we had fulfilled the requirements with regard to specific quality, whether they -- whether the shipments were properly packaged, whether there was any residual radiation on the package, and so on.

So there were a number of people who were involved in checking each specific shipment. These papers were dispatched not only to the receiver, but to the Government, and to the

shipper, that is, to the carrier, and it was trucked generally to the airport and transfers were generally made by air directly to the country involved.

Chairman Udall. Suppose I had had evil purposes, is there some place along this route of shipment that I could -- a private citizen, or someone could -- intercept and maybe substitute high-enriched uranium for low-enriched uranium or make some other changes in the contents of the package?

Dr. Shapiro. I think this would be very difficult to do. First of all, these were sealed; and, secondly, the receiver would recognize that there had been some mistake made both in terms of the enrichment or the weight or whatever the case may be.

Chairman Udall. I noticed just this one, down your list of shipments here, UO_2 , I guess uranium oxide pellets?

Dr. Shapiro. Yes.

Chairman Udall. U_{308} fuel pellets, UO_2 powder pellets. How big would a typical one of these shipments be, the kind I have been reading? Is this a box I could carry? Is it a huge container?

Give me some idea.

Dr. Shapiro. I don't know if there is anything here that is really typical because, as you can see, the quantities varied very significantly.

Chairman Udall. Give me the biggest and the smallest that you just note there. The largest one would be how big?

Dr. Shapiro. The largest would be a number of bird cages, which were probably 6 feet tall and several feet in diameter, and these were the containers that would be within this bird cage and they were bolted in place and the containers themselves were sealed.

Chairman Udall. What do they weigh when you get all through with it?

Dr. Shapiro. Well ---

Mr. Becker. With the bird cage and everything?

Chairman Udall. Yes, the shipping container and the contents.

Dr. Shapiro. Oh, several hundred pounds or more.

Chairman Udall. So you would need a forklift or crane ---

Dr. Shapiro. Oh, yes.

Chairman Udall. I see several to Germany here, UO_2 pellets. Is that some hospital shipment of some kind?

Mr. Becker. We may not have the same list.

Mr. Myers. We have a slightly different list.

Chairman Udall. I am trying to get an example now of a small shipment. You have given me the big one.

Mr. Krash. You mean the size or weight of the shipment.

Dr. Shapiro. This would also go in the bird cage containing this. There were some that did not require bird cages depending upon the enrichment. If they were very low enrichment, no, but I believe that unless we had natural or depleted material, it was necessary to use a bird cage to assure that there was no possibility of accumulating critical configurations because of the possibility of other shipments that might be on the same carrier.

Chairman Udall. I don't want to take too much time, but give me dimensions and weight for a small shipment. Find one there that is quite small and tell me how big that would

be, 6 inches square or what-have-you. Give me an example.

Dr. Shapiro. Well, here is oils and powder amounting to only 4 grams of material apparently. That would be a container probably -- packed in a container which might be like a pail, a 5-gallon pail or something of that sort.

Chairman Udall. All right. One foot to 2 foot in size, something of that order?

Dr. Shapiro. I guess.

Mr. Krash. That would be for what quantity, 4 grams?

Dr. Shapiro. That would be just 4 grams.

Chairman Udall. Does the size of the contain have any connection with the column "Percent Isotope," for example, here is one to France, UO_2 powder, 89.2; is that the level of enrichment indicated there?

Mr. Myers. 11-23-62 to France.

Chairman Udall. 4,000.

Mr. Becker. I don't think we have the same document.

Mr. Myers. Yes, this is from your documents.

Dr. Shapiro. 11-23-62, 89.2.

Chairman Udall. That is the percent isotope?

Dr. Shapiro. That is the enrichment.

Chairman Udall. Would that take a smaller or larger carton or does that matter? Does it have any bearing on it?

Dr. Shapiro. It is primarily the total quantity of the material and there were apparently somewhere in the neighborhood

of 4,000 grams, 4 kilograms. So it would be a large container and in a bird cage.

Chairman Udall. All right. Let me proceed to a couple of other things here. I asked a moment ago if I were evil-minded, how difficult it would be for me to intercept at some point along the shipment track one of these containers and substitute highly enriched materials for low-enriched materials, or low-enriched material for high-enriched materia; and you gave me an answer on that. How difficult would it be after the container was put together in the plant for me or someone else to get ahold of the container and do the same thing, make the same kind of substitution?

Dr. Shapiro. I would say it would be quite difficult because my recollection was that those were stored in the vault until shipment.

Chairman Udall. Over the years -- and again you had a great variety, but I just want to get a general approximation -- what portion of NUMEC's revenues came from foreign governments?

Dr. Shapiro. Comparatively little.

Chairman Udall. The majority of your work was for the U.S. Government and domestic?

Dr. Shapiro. For domestic, yes.

Chairman Udall. And I may have asked this previously. You said your shipments to Israel and to Israeli companies

were a relatively small part of your foreign operations.

Dr. Shapiro. I think it is important to note, Congressman Udall, that we never shipped special nuclear material to Israel other than possibly -- and I don't even know whether that is true -- a neutron source, which would contain only a very small amount of SNM.

Chairman Udall. Nothing in the range of bomb-grade quantities?

Dr. Shapiro. No material other than that. What we shipped to Israel was equipment, an instrument or something of that sort.

Chairman Udall. All right, Henry, I am going to leave this subject. Anything else?

Mr. Myers. What is your feeling with regard to the confidence we can have that high-enriched uranium was not shipped to foreign recipients in containers with labels indicating other contents? I think you may have answered that.

Dr. Shapiro. I think there is a high degree of confidence.

Chairman Udall. It would require for something of that nature to occur, it would require collusion at both ends, both at the shipping end and the receiving end?

Dr. Shapiro. Yes.

Chairman Udall. Because in an ordinary contract the receiver would know he was not getting what he had contracted for?

Dr. Shapiro. Absolutely.

Chairman Udall. All right.

Let me turn to something else related. It is of great importance to us in this inquiry whether a diversion could have occurred as it is whether diversion actually did occur. I want to pursue that a moment. I want to talk about some of these matters.

At the NUMEC plant did you have a 24-hour operation, three shifts, most of the time?

Dr. Shapiro. Yes.

Chairman Udall. And give me a brief outline of the layout. How big an operation did you have there?

Dr. Shapiro. The plant itself, I think, was 450 feet long or 500 feet long.

Chairman Udall. Okay, I am not trying to pin your down, just a rough idea.

Dr. Shapiro. 70 feet wide.

Chairman Udall. Big parking lot for your employees?

Dr. Shapiro. Yes.

Chairman Udall. Chainlink fences around the whole operation?

Dr. Shapiro. Yes.

Chairman Udall. Security guards and gates and that whole business?

Dr. Shapiro. Yes.

Chairman Udall. What kind of screening did you do to people coming in, visitors and employees?

Dr. Shapiro. Well, the employees for the most part were cleared either Q or L, and all visitors had to be announced through the guard or the receptionist, and there was not free access, if that is your question.

Chairman Udall. Yes, that is what I was getting at.

Dr. Shapiro. No, there was no free access.

Chairman Udall. And you had round-the-clock guards?

Dr. Shapiro. Round-the-clock guards.

Chairman Udall. And sentries at all places of entry?

Dr. Shapiro. Yes.

Chairman Udall. An outsider could not wander in?

Dr. Shapiro. When you say "round-the-clock guards at all places of entry," the answer to that is "no." We had round-the-clock guards at the place of entry.

Chairman Udall. I understand. I didn't state it correctly.

Dr. Shapiro. And they did also regular rounds.

Chairman Udall. And in addition, did you have more than one vault for the safekeeping of nuclear materials?

Dr. Shapiro. Yes.

Chairman Udall. Several?

Dr. Shapiro. At Apollo I believe we had two, but I don't recall.

Chairman Udall. Did your plant consist of several buildings or just one building?

Dr. Shapiro. We had -- do you mean the principal plant at Apollo?

Chairman Udall. Yes.

Dr. Shapiro. That consisted of one major complex of buildings with some outlying buildings in which we had some storage.

Chairman Udall. I want to talk a moment about an outside group gaining entry to your operation. Were the measures, security measures, you had adequate in your judgment to protect against the clandestine entrance of two or three people, a small group, who might have known the layout?

Dr. Shapiro. Yes.

Chairman Udall. This would be extremely difficult and undoubtedly would have been detected by your people in the way you operated?

Dr. Shapiro. Yes.

Chairman Udall. If a group of this kind maybe aided by some insiders had gained entry to the plant, what difficulties would they have had in trying to get to highly enriched uranium in your vaults or your safe storage places?

Dr. Shapiro. First of all, the vaults were locked and those who had access were the vault custodians, so they would have had to have overpowered a custodian or forced him in

some way to open the vault or he would have had to have been in collusion with them.

Chairman Udall. Sure.

Dr. Shapiro. So certainly that would be difficult. Furthermore, he would have to go through the change room. Otherwise it would become quite obvious that somebody who didn't belong was there. All of our people had badges.

Chairman Udall. So this would be highly unlikely that any group could have penetrated from the outside ---

Dr. Shapiro. I believe so.

Chairman Udall. --- and gotten through whatever security you had, to the uranium materials themselves?

All right.

Mr. Myers. Was there also a custodian at the vault 24 hours a day?

Dr. Shapiro. If material were in process -- and it was required that material be shipped in and out of the vault -- then we had a vault custodian. Otherwise, the vault was locked and the only access then would be via the guard himself, who at one time punched a clock in the vault and later on it was decided by, I believe, the security people and the AEC to eliminate the clock punch from the vault.

Chairman Udall. I have talked about outside penetration. Let me talk about inside. How difficult would it have been for some person with an evil design to seek work at your

plant where he would have access and then to spirit away quantities of SNM?

Dr. Shapiro. First of all, the person would have had to go through some clearance procedure. And, therefore, if the person had evil designs and had a history of that sort, presumably that would have been picked up by the security check. So that is certainly a major inhibitor to that, to start with.

Secondly, people were not isolated in their work. They worked with other people. So what that person would be doing would certainly over a period of time be noticed by neighbors.

Chairman Udall. There is no way that a person by himself could go in and seize or get his hands upon substantial quantities of special nuclear material?

Dr. Shapiro. I should think that would be highly unlikely.

Chairman Udall. You would almost need, from the standpoint of what you have told us about the weight of shipments and the places that your materials were kept, it would be almost impossible for one person by himself, even if he were in the plant and had fooled or had the confidence of his co-workers, to do anything much by himself?

Dr. Shapiro. I think that is true. In terms of material that was prepared for shipment, I think it would be highly unlikely that a person could ever do a thing like that by himself.

Chairman Udall. You have said that both of these instances, the outside penetration and the person who gets inside, are very unlikely. But assuming that in either case that some diversion had taken place. Were your records such that a shortage would have shown up in the record?

Dr. Shapiro. I believe they were. We kept records in accordance with the requirements of the Atomic Energy Commission, and I feel they were adequate to have done it, to have determined whether there was any major amount of material that might have suddenly disappeared.

Chairman Udall. My notes here talk about skimming. Henry, do you mean getting material in process and ---

Mr. Myers. Taking a small amount out from time to time.

Chairman Udall. And gradually would increase to a large amount. Is this possible or difficult given the nature of your processing, your operations?

Dr. Shapiro. I would say that that would be highly unlikely because what you are implying here, I think, is that this would have to be an operation that would have to go on over a period of time?

Chairman Udall. Right.

Dr. Shapiro. And repeated many times.

Chairman Udall. Yes.

Dr. Shapiro. And given the set of circumstances I would say that that would be highly unlikely.

Chairman Udall. Was the high-enriched uranium scrap that was associated with the WANL contract any more or less accessible to a skimming process than other materials that you had?

Dr. Shapiro. I would say it would be -- as far as accessibility to skimming, I think in general the answer is the material is really not accessible to skimming. I would say that in the case of the WANL contract by virtue of the nature of the material it is even worse, because of the pyrophoric character of the product and the necessity to keep it under an inert atmosphere and to package it under inert atmospheric condition.

Mr. Krash. You mean it would be even harder to skim?

Dr. Shapiro. Yes.

Chairman Udall. The word you used is a word to describe a material that can burst into flames simultaneously?

Dr. Shapiro. Yes.

Chairman Udall. In the papers we have and in the submission you made there is talk of some of the missing uranium at NUMEC being discharged with effluents. Could you tell me how this would happen?

Dr. Shapiro. Yes.

Chairman Udall. How was your plant locked up and to where would the effluents, liquids coming out of your plant, go? Was it connected to somebody's sewer system, or your own someplace? Discuss that with me so that I understand.

Dr. Shapiro. First of all, you realize there are a number of operations which involve fluids, water, acids, et cetera?

Chairman Udall. Yes.

Dr. Shapiro. These were collected and put into large tanks, holding tanks, where they were assayed. They were neutralized or whatever in order to assure that the chemical nature of the material was suitable for discard.

The assay was done and then these -- as I recall it now -- the material was then pumped into another holding tank so that the check could be made and then dumped out to the river.

Chairman Udall. Just dumped in a pipe running down to the river?

Dr. Shapiro. Yes.

Chairman Udall. Was there radioactive material in that effluent?

Dr. Shapiro. There were small quantities of radioactive material in the effluent, but these were in the parts per million quantities which were within the limits, allowable limits, for discard.

Chairman Udall. What kind of quantities?

Dr. Shapiro. Thousands of gallons.

Chairman Udall. Every day?

Dr. Shapiro. Yes.

Chairman Udall. And this was in compliance with the Clean Water Act?

Dr. Shapiro. Yes.

Chairman Udall. And whatever Federal regulations?

Dr. Shapiro. Whatever compliance was required with whatever acts were in existence at that time, yes.

Chairman Udall. You have agreed, I think, in all of this that there were probably several tens of kilograms of nuclear material missing over the period you operated at NUMEC?

Dr. Shapiro. There were materials ---

Chairman Udall. --- unaccounted for.

Dr. Shapiro. There was material that -- yes, which was unaccounted for, not what I would say was "missing" per se.

Chairman Udall. All right. Well, we have talked about some of it and I have asked you to give me a general estimate of what went into the garbage dump and how much was leached out. How much do you estimate of the missing material went out through the effluent into the river? Could you quantify that in any range?

Dr. Shapiro. I am sorry, I can't. Obviously there were kilograms over a long period of time.

Chairman Udall. Is this the major -- in your judgment as an operator of the plant and with all your experience, is this the major point at which we have lost uranium?

Dr. Shapiro. I really don't know whether that was the major point. There were a lot of places where uranium is normally lost, some of which are susceptible to measurement,

and others are not susceptible to measurement. The materials that we handle were not only in liquid form, but they were in powder form and consequently they became airborne rather easily as well. So you had material that would collect on the ceilings, on the walls, and as a matter of fact then we had special -- in order to assure that people were not breathing the material, we used to have hoods which were constantly pumped and therefore material went into filters and again some went through the stacks. The plant contained three huge ventilating fans because we had lots of furnaces in the plant, and it became rather hot, especially in the summertime, and it was necessary to have a large volume of air flow through that plant in order to keep it cool and certainly there was material that must have been sucked up through that and left the plant through that mechanism.

In addition to that, material spilled on the floors in spite of attempts to prevent it and it was necessary to clean it up and we had janitors constantly mopping the place to assure that we -- the mop waters were monitored to assure that there wasn't an excessive amount, but over a period of time it is quite obvious that even if you had a small amount, you would accumulate quite a bit of material over the years this way and later on a study was done by Mr. Lovett, and he indicated that we were, in fact, losing more material through mop water alone than we had ever anticipated.

I can't give you numbers. As a result of the nature of the mop water as being heterogeneous and, consequently, was not susceptible to good measurement, and the determinations by our analytical laboratory were therefore not as good as they should have been. Later on, of course, instrumentation -- better methods were devised.

But in any event, there was a great deal of material that was lost by mechanisms of that sort. So ---

Chairman Udall. There are several ways this move can ---

Dr. Shapiro. There are several ways in which material could be lost and not accounted for.

Chairman Udall. Some in the effluent, some in the leaching in the garbage pile, some in the mop water, some blown out by the fans?

Dr. Shapiro. Some even in the concrete, because the concrete is porous and we used to have -- this is highly acidic material and when they spill it on the floor, it would leach into the concrete.

Chairman Udall. This talk -- there is a lot of loose talk in some of these documents about losing this stuff in the pipes. By that, do you mean or do these people mean it is physically in the pipes or are you talking about these kinds of drainages we just mentioned, the effluent, the mop water ---

Dr. Shapiro. You can lose it two ways in terms of the

pipes: You lose it from the effluent and you also have material that coats the walls of the pipes just as you would in the case of household plumbing.

Chairman Udall. Sure.

Dr. Shapiro. If you have ever opened up a pipe, you would notice there is a good deal of sediment that collects, material that collects in the thing.

Chairman Udall. Sure.

Dr. Shapiro. So, in addition to that, we had a great deal of maintenance on the plant as a result of the corrosive nature of the material, and they would remove pipes and/or valves, pieces of equipment, and we found that on occasion the workers would not follow instructions properly and they would discard that and bury it without having properly washed it and leached off the material as they were instructed to do.

Chairman Udall. So it is your best judgment that the accumulation of all these little things we have talked about, the slippage of each one of these points, could add up to the kind of MUF that we had at Apollo?

Dr. Shapiro. Absolutely.

Chairman Udall. What would then be your answer to some of those who point the finger of suspicion here that the MUF at Apollo, quantities of that were much larger than comparable other facilities used by the Government. Do you challenge

that assertion or do you have some explanation of why your losses would be larger than other plants?

Dr. Shapiro. Our losses were not larger than those of other plants doing similar work. The report that was put out by the Atomic Energy Commission, NRC, DOE, whatever it was, last August ---

Mr. Becker. Of 1977.

Dr. Shapiro. August of 1977, indicated that there was no statistical difference between the losses which were incurred in our plant versus those that were incurred in other plants doing similar work.

So it is true we did not take credit for some of the losses that were through the stacks which we probably should have, and did later take credit for.

Chairman Udall. All right.

Dr. Shapiro. We had over 100 stacks in the plant.

Chairman Udall. I have run by a lot of theories; let me try one more on you.

Could a workman intent on diverting uranium have used low enriched uranium to dilute high enriched uranium and then skim off some of the high enriched material?

Dr. Shapiro. All of the product had to be assayed from the quality point of view. One of those assays was the enrichment, and we couldn't ship the product unless it met all those specifications.

Furthermore, if a product were shipped to a customer he does his own assays on the other side. He had to determine whether our weights were correct, whether the assay of U-235 itself were correct, and if they were not in accordance with the specifications I can assure you we would have heard.

Chairman Udall. I am going to refer to a memorandum of November 27, 1973, of Paul Gaughran, Director of the Division of Security of the AEC wrote that in examining the history of NUMEC's security procedures, that such "procedures were not designed or geared to prevent an employee from removing

quantities of strategic nuclear material from the facility."

Would you agree with that assessment?

Mr. Krash. Excuse me just a moment, Mr. Congressman.

Mr. Myers. This is page 8. That's [indicating] it.

Mr. Becker. Background and history, page 8.

Chairman Udall. Yes, 4th line down. I just read one sentence. It's the 5th line down.

Dr. Shapiro. First of all, this refers to a period of inspection after I had left the facility and had nothing to do with it. I mentioned I had left in 1970. This refers to 1971 when this was under either Babcock & Wilcox, or Atlantic Richfield, I don't know. I certainly can't speak for them. What I can say with regard to our security is if you will refer to another document that was produced by the inspection people of the Atomic Energy Commission, they had indicated that during this period that we did in fact have adequate security measures and not only that, but that our personnel were highly conscious of the security aspects.

I believe you will see that among the documents that you have.

Chairman Udall. I think what they are getting at here -- and I want to leave this subject in just a minute -- they are saying in effect that while you can have adequate protections against the people who with violence and force come in and seize something, and while you can have adequate protections

against the clandestine invader who tries to take something, that the procedures were not really designed to prevent an inside job, some official or somebody in the management of the facility from diversion. Isn't that what they are trying to say?

Dr. Shapiro. If that is what they are trying to say, I would say that that certainly was not the case at NUMEC as far as I was concerned.

Chairman Udall. Could you have made a diversion if you had wanted to? Could you have arranged a diversion of substantial material yourself if you had wanted to with your knowledge of the process? Would you have required a number of people helping you, and this sort of thing?

Dr. Shapiro. I would have required many people to help me.

Chairman Udall. People inside the plant who knew something was otherwise wrong?

Dr. Shapiro. Absolutely.

Chairman Udall. All right. Let's try another facet of this. We are making a little progress here. I think we will finish in due time.

You had, NUMEC had a subsidiary in Israel, Israel Isotopes and Radiation Enterprises Ltd., or sometimes called "ISORAD", and it was allegedly half-owned by the Israeli Atomic Energy Commission. Is that correct?

Dr. Shapiro. Not "allegedly", it was half-owned by the Israeli ---

Chairman Udall. All right, strike "allegedly."

Why did you form this subsidiary? What was it supposed to do? What was your relationship with it?

Dr. Shapiro. Do you mean NUMEC's relationship with it?

Chairman Udall. Yes.

Dr. Shapiro. We owned 50 percent of the company. The purpose of the company was to primarily to irradiate food for the purpose of pasturization to prevent spoilage. Also, to kill fruitfly infestation in citrus, and for export purposes.

Chairman Udall. Is this a fairly common procedure in many countries?

Dr. Shapiro. No.

Chairman Udall. This is a new kind of technology, is it?

Dr. Shapiro. No. It is not a new technology, it was not a new technology at the time. What we were doing was adapting the technology which was under development in the United States at the time primarily at NADIC which is an Army supply center and the Davis Campus of the University of California where they were doing development of procedures for the irradiation of citrus for preservation purposes.

Chairman Udall. How highly enriched does material have to be that you use this process?

Dr. Shapiro. I think you misunderstand, Congressman Udall. These processes do not employ special nuclear material. They employ a radiation source, generally cobalt.

Chairman Udall. Okay. How big an operation was this in terms of people, offices, including ISORAD, and others?

Dr. Shapiro. We had our facilities initially at Yavne which is the Israel Atomic Energy Commissions research center and there were several irradiation facilities, one of which was in the pool of the pool reactor; and we constructed the facilities for this. We constructed the equipment and the tools and worked with the technical people there in the development. Later on there were other radiation facilities that were put in operations.

Chairman Udall. At peak, how many employees would ISORAD have had?

Dr. Shapiro. Oh, ---

Chairman Udall. A few dozen?

Dr. Shapiro. Not even that many.

Chairman Udall. Were any of those -- were most of the ISORAD employees Israelis or was it a mix of ---

Dr. Shapiro. They operated in Israel so they were all Israelis except for an occasional person from NUMEC who went

there to either install equipment or to assist them in a particular problem.

Chairman Udall. Was there any need or requirement that ISORAD employees who were Israelis come to NUMEC in Pennsylvania from time to time?

Dr. Shapiro. Yes, on occasion.

Chairman Udall. Generally for what purposes?

Dr. Shapiro. First of all there were discussions with regard to the business itself; secondly, there were technical -- when we shipped equipment there were technical discussions with regard to the design of the equipment and et cetera for the utilization of it, and the installation. And it was some sort of --

Chairman Udall. So there was an occasional visit. It was not unusual to have ISORAD Israeli employees visiting you at NUMEC from time to time?

Dr. Shapiro. There were occasional visits of this type

Chairman Udall. Did they have free access to the NUMEC premises, and to your ongoing operations there?

Dr. Shapiro. Their access was restricted like the access of any other alien.

Chairman Udall. They could not go through your equipment or your files or your processes?

Dr. Shapiro. No.

Chairman Udall. All right.

The Washington Star, in a story published last November

6th ---

Mr. Myers. That means '77, of course.

Chairman Udall. -- in '77, yes, reports that Ephraim Lahav, then counselor on scientific matters to the Israeli Embassy in Washington, repeatedly visited with you at the NUMEC-Apollo plant in the early to mid-1960s. Did he, and why? Why did he visit you, if indeed he did?

Dr. Shapiro. Congressman, I don't even recall who Ephraim Lahav is. There were people who visited us but I don't recall Lahav.

Chairman Udall. Was it unusual for scientific people from the Israeli embassy or offices in New York to come to Apollo on visits?

Dr. Shapiro. It was not unusual for the counselor, scientific counselor to come to NUMEC.

Chairman Udall. How about Mr. Hermoni?

Dr. Shapiro. I don't recall his ever visiting Apollo, although he came to Pittsburgh; he may have. I don't recall.

Chairman Udall. All right.

Dr. Shapiro. But one of the people that did visit that I do recall on two, possibly even on three occasions, was David Pellig who is the administrative director of the Israeli

Atomic Energy Commission who had specific responsibility for our joint operations of ISORAD, and in addition to that, the business relations were generally carried out by the scientific attache in Washington.

Chairman Udall. Since the government itself was a half partner.

Dr. Shapiro. Yes.

Chairman Udall. These people were acting and visiting you on behalf of the government.

Dr. Shapiro. Yes, they acted on behalf of the government.

Chairman Udall. Fine.

In the January 9, 1977, I guess that means, Newsweek -- you say '78.

Mr. Myers. No, that one is '78.

Chairman Udall. [Continuing] Newsweek refers to meetings you held with Avraham Hermoni, a scientific counselor at the Israeli Embassy in Washington. Who is he, and what kind of relationship did you have with him while you were at NUMEC?

Dr. Shapiro. Well, you describe him as the scientific counselor, which he was indeed, and during the time that he was scientific counselor he conducted the business, the ISORAD business on behalf of the government of Israel. And in addition to that he was interested in technical assistance from time to time.

Chairman Udall. Did you ever have any indication that he was associated with the Israeli nuclear weapons program, if they had one?

Dr. Shapiro. I don't ---

Chairman Udall. This was just never called to your attention, or you had no reason to believe that that might be the case?

Dr. Shapiro. No, as a matter of fact, I first met him at the University in Israel as I recall it.

Chairman Udall. How frequently did you see him during the time he was in Washington, and you were operating NUMEC?

Dr. Shapiro. I don't recall exactly. Maybe, probably less than half a dozen times.

Chairman Udall. The British Broadcasting System, in a documentary on the question of Israeli nuclear capability, called you a frequent privileged visitor to Israel.

Were you frequent, and did you feel privileged?

Dr. Shapiro. I am flattered.

Chairman Udall. I think one of the things they mentioned was that you were given a special flying tour of the Egyptian frontier or something. On the occasion of your visits did you get attention that you thought was special or privileged?

Dr. Shapiro. Oh yes, but I got attention that other visitors have gotten, I know that.

I have been to Israel I believe some 17 times. If that

is "frequent", yes, I was a frequent visitor. Insofar as "attention" is concerned, I am a member of the local board of Israel bonds; I am a member of the Jewish National Fund; I am a national officer of the Zionist Organization of America, and, therefore, I am met and greeted by my counterparts and to the extent that I had business with the Israel Atomic Energy Commission I am met and greeted by them.

Chairman Udall. Do you recall an event where you got a flying tour that was unusual?

Dr. Shapiro. A flying tour that was unusual? It was very unusual for me because what happened was that I was there in '67, and I took a tour that others took, too, and then we flew over -- we flew over the Sinai, landed in Al Arish and Tiran.

Chairman Udall. I don't particularly want to beat this one to death, but there was nothing particularly special about this; had you requested it, or did the government want you to do something, or see something, or was this a special opportunity to see the front?

Dr. Shapiro. This was right after the '67 war; and I wanted very much to see the area.

Chairman Udall. Okay. One of the documents says that -- a memorandum from Tharp, Deputy Director of the Division of Security in the Albuquerque Operations -- Tharp

quoted Dr. Shapiro as having present intentions of moving to live in Israel. Did you ever intend to emigrate or consider it or take any steps toward it?

Dr. Shapiro. I never took steps towards it, but I certainly considered it because I think any Zionist considers what is called "aliyah", and I certainly considered it.

Chairman Udall. Have you ever had at any time that you can recall any discussion with Israeli citizens who you knew or believed were involved in the Israeli nuclear weapons program?

Dr. Shapiro. Mr. Congressman, I don't know that they have other than what I have read in the newspapers. Consequently, I really would not know, therefore, who would be involved in such a program if they have such a program.

Chairman Udall. Were you ever involved or do you recall any relationships or contacts with people who might have been known to you to be an Israeli intelligence operator or in Israeli intelligence operations in this country?

Dr. Shapiro. In this country?

Chairman Udall. Yes.

Dr. Shapiro. No.

Chairman Udall. Or in Israel?

Dr. Shapiro. In Israel I met the head of the military intelligence there.

Chairman Udall. Have you ever been asked to provide

classified information to people who were not authorized to receive it?

Dr. Shapiro. No.

Chairman Udall. On December 11, 1971 the AEC Security Director Riley wrote that Dr. Shapiro had told him that the Israelis had told Dr. Shapiro -- we are getting third- or fourth-hand removed here -- the following information: that an AEC Commissioner told officials of a foreign government other than Israel that the Commission suspected Dr. Shapiro of having helped divert bomb-grade uranium to Israel.

Do you remember saying this to Riley?

Dr. Shapiro. I don't recall it.

Chairman Udall. On June 20, 1969, there apparently was a meeting between you and someone from the Israeli Embassy at the Pittsburgh airport -- let me back off here.

On October 30, 1970, Robert Tharp -- was this the material give to us?

Mr. Myers. Yes.

Chairman Udall. --- then Deputy Director of Security at the AEC, wrote a memorandum to H. C. Donnelly, manager of the AEC Albuquerque Operations Office, in which Tharp described a meeting between Dr. Shapiro and AEC staff. He said that during the course of this meeting that Riley had advised Shapiro that he, Riley, had indicated to the Commission that Dr. Shapiro had been less than candid in

clarifying the derogatory implications, particularly the airport incident.

Did you have a meeting with an Israeli official in the Pittsburgh airport on or about June 20, 1969, at the airport?

Dr. Shapiro. I had a meeting but the date I don't recall, with an Israeli official - specifically the scientific counselor.

Chairman Udall. What was his name?

Dr. Shapiro. I think his name was Ephraim Lahav, but I don't really recall.

Chairman Udall. How did this meeting come about?

Who asked for it?

Dr. Shapiro. I asked to meet him because as I had indicated earlier, we had in fact shipped some equipment to Israel and I had -- they were delinquent in payment; and I had repeatedly asked for payment and this was getting very embarrassing to me because in view of the fact that we had already merged with Atlantic Richfield, and we were about to have an audit, they wanted to have payment made as quickly as possible.

Chairman Udall. For what? Was this a contract?

Dr. Shapiro. This was for equipment that we had shipped.

Chairman Udall. ISORAD, or another contractor?

Dr. Shapiro. To Israel. I don't know whether it was in connection with ISORAD or whether it was in connection with

the research establishment or whatever.

Chairman Udall. What was the amount of the claim you had on them in indebtedness?

Dr. Shapiro. It was quite a large amount. Many thousands of dollars.

Chairman Udall. Tens of thousands?

Dr. Shapiro. Yes.

Chairman Udall. You don't remember anything more than that?

Dr. Shapiro. I don't remember precisely. And I had asked to meet with him. And it was a matter of convenience for both of us that we met at the airport. I had offered to come out to Washington as I recall it, and he said he was actually going to be passing through Pittsburgh on his way to I think it was Dayton, and asked in view of the fact that he was stopping over, could we meet; and I agreed to do so.

It was a convenience to him because otherwise he would have had to travel an hour and a half or two hours from the airport to Apollo so it would be, you know, a three or four hour trip just in travelling. And it was a convenience to me because it means that I didn't have to go into Washington.

Chairman Udall. So you drove to Pittsburgh, and met his flight?

Dr. Shapiro. Yes.

Chairman Udall. By yourself?

Dr. Shapiro. Yes.

Chairman Udall. Did the two of you meet?

Dr. Shapiro. Yes.

Chairman Udall. For how long?

Dr. Shapiro. Between planes. I don't recall exactly how long.

Chairman Udall. A few minutes; an hour?

Dr. Shapiro. Oh, it may have been an hour, thereabouts.

Chairman Udall. He was by himself?

Dr. Shapiro. He was by himself.

Chairman Udall. Where did you meet him?

Dr. Shapiro. I think I met him at the gate and then I think we went to the Ambassadors Club, the TWA Ambassadors Club.

Chairman Udall. Can you tell us what occurred there?

Dr. Shapiro. I told him I was very embarrassed and that I had requested payment on a number of occasions, gently, and that for some reason or another I had been reassured that it was on its way, but it was -- we had not yet received payment and I felt that it was desirable for him to urgently request Israel to remit.

Chairman Udall. What did he say to that?

Dr. Shapiro. He arranged for it and we got payment very shortly thereafter.

Chairman Udall. Within a few days?

Dr. Shapiro. I don't know whether it was a few days but

it was shortly after.

Chairman Udall. That payment was by check, a draft through a bank or something?

Dr. Shapiro. I would assume that that would be the way it was paid, but I don't remember exactly how it was paid. I am sure it was not in cash.

Chairman Udall. Was anything exchanged at that meeting between you, cash, objects or anything else?

Dr. Shapiro. No.

Chairman Udall. You are certain of that?

Dr. Shapiro. Positive.

Chairman Udall. No package or parcel or object or paper or anything that you can recall?

Dr. Shapiro. I certainly don't recall any exchange of anything.

Chairman Udall. It's probably unfair to ask you to comment on other peoples' motivations or conclusions, but do you have any idea why this fellow Riley would have said that you had been less than candid in clarifying the implications of this particular airport meeting?

Dr. Shapiro. I really don't know.

Chairman Udall. You do recall specifically that he was going on to Dayton somewhere beyond Pittsburgh?

Dr. Shapiro. Yes.

Chairman Udall. Not as the information was that that I thought I had, that he turned right around and went back to Washington?

Dr. Shapiro. My recollection was that he was going to meet his daughter who was visiting a friend.

Chairman Udall. Did you take him back to his departure gate or did you leave him?

Dr. Shapiro. I probably took him to the plane, but I don't really remember.

Chairman Udall. You don't recall whether it was a Dayton plane or Chicago, or Washington plane?

Dr. Shapiro. I don't remember.

Chairman Udall. Let's talk about secure communications.

Various John Fialka articles in the Washington Star have talked about a secure communications system. He has talked about scramblers and encoding device. Without getting bogged down in terminology, was there any kind of device or system that you would call "secure communications" system at Apollo or at NUMEC?

Dr. Shapiro. Not that I know of.

Chairman Udall. You would have known it as the chief executive officer.

Dr. Shapiro. I was told in a story I heard, Mr. Congressman, on the air about a congressman who was talking to Indians ---

Chairman Udall. Okay.

Dr. Shapiro. That's it precisely, it's pure unadulterated goombah.

Chairman Udall. All right.

Let me not limit my question to the NUMEC plant at Apollo.

Let me ask you about Raychord Steel, or Apollo Stell. They were adjacent to your premises?

Dr. Shapiro. Yes.

Chairman Udall. Was there a secure communications system at either one of those operations that you know of?

Dr. Shapiro. Not that I know of.

Chairman Udall. And if there was, if you had used it, or had access to it, you certainly would remember.

Dr. Shapiro. I certainly would have remembered it. I never used such a device.

Chairman Udall. This is one of the troubling things -- go ahead.

Mr. Terrell. No, that's all right.

Chairman Udall. This is one of the troubling things about this whole endeavor we have been engaged in is these rumors and reports get started and gain credence, and they are repeated.

Mr. Krash. We would like to have Mr. Fialke here to cross examine him.

Chairman Udall. This is one of the most persistent ones that we have heard about.

Dr. Shapiro. It makes for a good story, I am sure.

Chairman Udall. As far as you know, you never heard of it, never saw it, or never used it either at your company, Raychord, or Apollo Steel?

Dr. Shapiro. That is right.

Chairman Udall. All right. Let me refer again to the October 30, 1970 memo of Robert Tharp. The memo indicates that you were informed that the Commission might decide whether the Commission's Administrative Review procedures should be used to resolve the question of whether you should be granted a Q security clearance.

Do you know why the AEC had questions and I guess for the record we ought to say we are talking about the period when you sold NUMEC, after you sold NUMEC to Atlantic Richfield and you went back to work for Westinghouse and you were seeking a security clearance to do some work there; is that correct?

Dr. Shapiro. This was at Kawecky Berylco.

Chairman Udall. Okay.

All right. What seemed to be the problem? Do you have any idea why they were giving you difficulty with regard to the security clearance? Can you enlighten us on that?

Dr. Shapiro. My clearance pertained to reactor applications. When I went to Kawecky Berylco they were working on other security matters, and it required an enhanced security clearance. Furthermore, it is customary that there isn't a simple transfer

of security clearance, it is necessary to reinstate the clearance after one leaves one installation for another. So I went through the usual application for the clearance, and I then expected that it would take the usual time which was maybe two or three months and when I did not receive notification of clearance, I called to determine what the problem was and I was told that it was necessary to reinvestigate the situation because of the enhanced clearance requirements, but that it was a matter of time, and to be patient; and that happened on a number of occasions.

I don't know whether I have answered your question.

Chairman Udall. Did you get the feeling that the delay, inability to get a fairly prompt security clearance again related to the various investigations of NUMEC and the MUF and the circumstances surrounding this, or did you feel that you believed it had regard to something else?

Dr. Shapiro. As I recall it, as a result of my conversations with Riley, I believe that one of the factors that he talked about was the Israeli -- my Israeli connections.

Chairman Udall. All right. One of the questions raised here and I will raise it with you directly, you apparently had a right to go before the Commission's Administrative Review Procedures Board and get this matter cleared up, and you decided apparently not to press the clearance question with the

Atomic Energy Commission and instead moved on to a position with Westinghouse.

What were your motives, your reasons for doing that?

Dr. Shapiro. It wasn't quite that way.

Chairman Udall. All right, explain it to me.

Dr. Shapiro. I was in fact pressing for clearance; however, without seeking a position at Westinghouse I was called by the President of the Power Systems Company and asked to come to see him about the possibility of a position. I was offered a very attractive position at a much more attractive salary and I decided to accept that position.

Chairman Udall. It did not involve a security clearance, or this level of clearance?

Dr. Shapiro. It did not involve this level of clearance and when I accepted the position, the whole matter, of course, became irrelevant to the Westinghouse position.

Chairman Udall. The implication in all of this is that you were afraid you couldn't get clearance and were fearful of further investigations and, therefore, said, "to heck with it" and took the Westinghouse position.

Dr. Shapiro. That may be the implication, but that is not --

Chairman Udall. That is not the case.

Dr. Shapiro. --That is not the case.

Chairman Udall. I wanted to clear that up. Related to

that, and not very important, there is a letter from you to then-Commissioner Ramey in June '71 which suggests that Ramey had provided you assistance and advice that led to your taking the Westinghouse job.

Did he in reality assist and advise you?

Chairman Shapiro. I would hardly say that he assisted me, but we discussed it. And as a result of not only discussions with him but in discussions with others and my family and all other considerations, I finally decided to accept the job.

Chairman Udall. One final one on this security clearance problem; there is a memo by Riley of December 11, 1970 which says that you consulted Mr. Hermoni, the science advisor I mentioned earlier, concerning your inability to get your clearance renewed with the AEC, which would raise an inference that you were aware that somehow your problems on the clearance were bound up with your relations with the Israeli Government.

Did you think that Hermoni could help you with regard to that?

Dr. Shapiro. No, sir, I just stated, you had asked me did I have any feeling for why there might have been some holdup in the clearance, and I indicated that I, as a result of conversations with Riley, it became clear that this was one of, if not the principle, issue. This was one of the issues.

Chairman Udall. Yes.

Dr. Shapiro. And I must have -- although I don't recall specifically -- must have discussed the, he may have discussed the Hermoni issue with me, and that is how this whole thing arose.

Chairman Udall. I think the thing that puzzled me was if indeed your connections and affection for Israel was part of your problem with the clearance, why one would assume that Hermoni could help you get the clearance.

It seemed a little bit odd.

I guess you have explained it.

Dr. Shapiro. I don't recall the specific circumstances of that but it undoubtedly led from the discussions I had with Riley.

Chairman Udall. I don't know whether this is important enough to take your time, but let me run it by you quickly. In some of the documents that we provided you, there are suggestions that people on the AEC staff felt that you went over their heads from time to time to the Commission itself when you felt the staff had been overly scrupulous in enforcing contract conditions.

Did you appeal to the Commission to make known such concerns from time to time and why, and which ones?

Do you care to comment on that? I recognize it's broad and kind of shotgun.

Dr. Shapiro. I really have no recollection of that.

Chairman Udall. Did you ever complain to the Department of Justice that the FBI had harassed you or had you under surveillance or had given you trouble?

Dr. Shapiro. No.

Chairman Udall. I have about concluded the range of things I wanted to cover. Let me suggest, Abe, that we talk about a five minute break here and let me check with my colleagues and check my notes.

Mr. Krash. Sure, fine.

Chairman Udall. Bob, for Congressman Bauman, do you have anything you wanted to cover?

Mr. Terrell. No.

Chairman Udall. Let's take a break here.

Mr. Terrell. Would you go through the statement?

Chairman Udall. Yes, go ahead. Ready?

Mr. Terrell. Is the machine running?

On page 4, you note, "Apart from what I have read in the press, I have no knowledge whether Israel does or does not have a 'nuclear weapons program'." Is that correct?

Dr. Shapiro. That is what I stated.

Mr. Terrell. You really have no knowledge one way or the other, other than the extent of this?

Dr. Shapiro. That is true.

Mr. Terrell. With your connections in Israel as far as military intelligence, there has never been any discussion with you at any time relative to their capability?

Dr. Shapiro. My discussions with the military intelligence people pertained to a long-lived battery to be used in intrusion detection.

Mr. Terrell. But it never got outside of that area of discussion; you never -- your concern for Israel's defense, it would seem to me that that would be a natural thing you would want to know, what military capability they would have, particularly in the nuclear weapons end of the thing. I know you were concerned in 1967 to take the tour that you did after the war. With your concern, it would just seem that you have a little bit more knowledge than I.

Dr. Shapiro. I would say that many others have taken the

tour.

Mr. Terrell. I am not suggesting you were alone on that tour. I am just suggesting that from your concern ---

Dr. Shapiro. Others were interested in taking the tour, and did take the tour in '67.

Mr. Terrell. And you don't know any more than I know from reading the press.

Dr. Shapiro. I would know exactly what you know if I had read the same press articles.

Mr. McNulty. I have a question.

Chairman Udall. Yes, go ahead.

Mr. McNulty. In the BBC documentary they carried this possibility of the diversion of NUMEC materials by something called "plumb bat." Does that ring a bell? Are you familiar with that at all?

Dr. Shapiro. I have heard the name.

Mr. McNulty. It's supposedly some scheme to divert some unknown tons of material---

Mr. Krash. There is a book on the subject.

Mr. McNulty. Yes.

Mr. Krash. Published by the London Times, Sunday Times, which I assume you have seen.

Mr. McNulty. Right. And I just wonder if you had known anything about it.

This book fairly convincingly portrays the ability of

Israeli intelligence to -- well, I guess "divert" is a word -- to divert a whole shipload of yellowcake from the middle of the Mediterranean. You talk about how extremely difficult it would be to divert uranium at NUMEC. If they are so skilled as to be able to carry out this "plumb bat" affair, it just seems that that same skill could be used. I just wanted to throw that out. I guess you really couldn't comment on that.

Chairman Udall. That was pretty far afield.

Mr. McNulty. Yes, I guess.

Chairman Udall. I have only one or two more questions and I am nearly through. Why did you sell out the NUMEC facility to Atlantic Richfield, just as a matter of curiosity?

Dr. Shapiro. Well, I had been looking for the possibility of selling the company to a large company for -- ever since the new law, I guess it was '64, was passed, which allowed for private ownership of special nuclear material. The reason for that was that the cost of special nuclear material was so high that private ownership required large amounts of capital and, also, the ability to borrow money at prime rates, and we were not in the prime rate category, and consequently we were at a serious disadvantage from a competitive viewpoint with companies which did have the ability to borrow at prime rate. And I felt it was necessary to rectify that situation by becoming connected with an organization which, in fact, could -- had that kind of capital; and, as a matter of fact, I fought hard against the

private ownership bill for, as I recall it, two years and gave testimony in connection with that and managed to hold it up, I think, for a year, with a little conflict, but nevertheless I did that, and so I wanted somehow or other to rectify that problem that we were in, and this was not simply a progression of events that occurred.

Chairman Udall. Had you kept the same group of investors over the life of NUMEC, the same original group that went into it? Had there been some changes?

Dr. Shapiro. Oh, a number of changes, because we had a number of financing arrangements subsequent to that original group. The original group, as I indicated earlier, was somewhere in the neighborhood of \$250,000, and that was a pittance compared to what was eventually required for the nature of the business that we in fact built up.

We needed a multimillion-dollar investment, and therefore we had followed that original investment not only by the borrowing, but then floated a \$295,000 fund -- that is, sale of stock -- within the state, and that was in May subsequent to, as I recall it, subsequent to our going into business. Then there were --

Chairman Udall. You didn't go public in the sense that you went out and solicited investors from a large area?

Dr. Shapiro. We did go public.

Chairman Udall. You did go public?

Dr. Shapiro. Yes, we did go public, and that was handled by one of the investment bankers for us.

Chairman Udall. At any time as you expanded and got larger investors, were you aware of any investment by the Israeli Government or people acting in behalf of them?

Dr. Shapiro. No. No.

Chairman Udall. When this large MUF finally was discovered or identified at NUMEC, did this cost your company a good deal of money; were you liable, was the company liable, for missing --

Dr. Shapiro. We were always liable for missing material.

Chairman Udall. Was this a very heavy burden?

Dr. Shapiro. It was certainly a heavy burden, but as you may recall from reading the reports, we had already declared losses, as I recall it, of 149 kilograms of material, and we had to pay for those, so this was the difference between 149 and 178, so we had already been paying heavily for the material.

But in every contract what we tried to do was to anticipate what those losses might be and to put in the contract price those anticipated losses so that they would cover it. Naturally, if we underestimated those losses, then, of course, it would hurt us.

Chairman Udall. Were you ever in serious financial trouble as a company because of the losses that you had to pay the Government for?

Dr. Shapiro. Well, we certainly had -- we certainly had a severe cashflow

problem as a result of these losses. But in terms of financial -- serious financial difficulty we had arranged prior to this time a fairly substantial line of credit with the Mellon Bank.

Chairman Udall. When you finally sold out to Atlantic Richfield, did you and the other investors make a profit on your original investment of money? Was this a profitable sale for you?

Dr. Shapiro. Well, I had not invested any money, and I got some stock, and therefore anything I would have gotten out of it --

Chairman Udall. You were ahead.

Dr. Shapiro. I would have been ahead except for the fact that I put my heart and soul into this whole thing, and I don't know how much one can pay for that in money. And insofar as other investors are concerned, as I mentioned, it depends upon when.

Our original sale of stock was equivalent, as I recall it, to ten cents per share, and what we call our automobile dealer friend sold out at \$135. a share. So I think he made a substantial profit.

Chairman Udall. Yes.

I am through. Questions, anybody?

Mr. McNulty. Not here.

Mr. Myers. I have a brief one.

While you were announcing along the way that these losses were occurring, it seems somehow not to have been gotten to the Commission itself. Because it seems that it wasn't until the summer of '65 that they seemed to demonstrate a lot of concern, they had meetings and deciding what they were going to do about all this. Somehow it seems to have escaped their consciousness until then.

Dr. Shapiro. I don't believe that that was so.

Mr. Myers. I mean like this August 2 memorandum starts out by saying, from Brown to the Commissioners, starts out by saying --

Mr. Becker. Just a moment. August 2?

Mr. Myers. August 2. It's the one we had out before.

Chairman Udall. For the record, what year is it?

Mr. Myers. This is August 2, '65. It starts off by saying, "We are faced with a potentially serious problem involving the possible shortage..." and so forth.

I don't think this has--may not have--anything to do directly with you, but the fact is there seems to be starting about this time a major concern demonstrated by the Commission about all this and how they are going to handle it, and they have a meeting where you attend, on August 10, and then they have their own meeting -- other meetings-- along the way, and it just seems hard to understand why this concern suddenly gets to them and why it had not been there before.

What was it that happened at this time that made them demonstrate this worry?

Maybe we should ask them, but --

Dr. Shapiro. I think that that would be most appropriate.

Mr. Myers. But do you agree that that's the case?

There seemed to be -- Howard Brown seems to be notifying the Commission for the first time that we are faced with a potentially serious problem?

Mr. Becker. He is talking about a particular contract and the documents related to it.

Mr. Myers. There were 60 kilograms associated with that contract, but, if you had been announcing losses along the way -- which I gather you had been -- why was it that the Commission, Howard Brown is suddenly saying, "We are faced with a potentially serious problem"? Because most of that 60 kilograms --

Dr. Shapiro. Would you care for me to speculate? Is that it?

Mr. Myers. Sure.

Well, anyhow, that's one of the big questions about all this, of course, which --

Mr. Becker. I think you would have to ask the people who wrote the document what they had in mind at the time.

That is what your question is.

Mr. Myers. I think what they would say is that, "Well,

yes, maybe it was being reported, but somehow it didn't, or, we weren't, you know, it didn't strike us. We were not really aware of what it really was."

I think that's what they would say.

Mr. Becker. I am lost. Is there a question?

Mr. Myers. The question is that here, if losses were being announced along the way, and they were being reported along the way, why is Howard Brown suddenly saying, "We are faced with a potentially serious problem"?

Since the problem had been existing for a long time, why is he suddenly on August 2 informing the Commission of this?

Mr. Krash. Do you have anything to shed any light on that, Dr. Shapiro?

Dr. Shapiro. I think it is clear that what they are referring to here is a particular contract which entailed the loss of approximately 60 kilograms of material which would -- on that basis approximately six percent of the total material and I would guess that was the reason for their concern.

Mr. Myers. Because that would be a higher percentage than on most contracts.

Dr. Shapiro. As I pointed out earlier, the reason for the higher percentage of loss, processing loss in this contract than in other contracts is because of the nature of the material that needed to be fabricated and the low yields -- I didn't mention this previously -- and the low yields that

we got which required the constant recycling of materials.

So what you had was the accumulation of, repeated accumulation of, losses as a result of the recycling.

Mr. Myers. All right.

Dr. Shapiro. Nobody previously had ever attempted to make in quantity this flyspeck material having these stringent specifications.

In retrospect, I think we were fools to have undertaken it.

Chairman Udall. Bob?

Mr. Terrell. I have only one question and I think I was making a phone call when you were talking about it. You mentioned, and I think it was verified later, that your assay on the Kimwipes and whatever other materials were used, was inaccurate. This was only discovered as a result of digging up and doing some sort of backward counting to find out that you, in fact, not only varied two kilograms, in fact it was considerably more than that.

What I am wondering is: Is the same technique applied to the effluent that leaves the plant that goes into the river, and can we assume that there could be some inaccuracies there as to how much actually went out through that effluent?

Dr. Shapiro. Let me explain. The problems with regard to assaying material, the amount of material depends upon the character of the materials to a large degree. Whether it's

homogeneous, whether it's inhomogeneous, and whether it is in fact distributed on material.

When it is inhomogeneous and distributed on a lot of material, it is extremely difficult to get an accurate assay. And in this particular instance the assay was done by radioactive counting of the package, and that indicated by virtue of the counts that we got off of it, that there was very little material associated with it. Consequently it was buried.

But, when we tried to do a more accurate estimate, by actually burning the material, then it became apparent that there seemed to be much more associated with that than we had dreamed of.

Now, in connection with the liquid effluent that we are talking about, there are also problems in that again there is a homogeneity problem, whether or not the material is suspended, or whether it is in solution.

Obviously, if it is in solution, it is much easier to get an accurate estimate. If it is suspended, then it depends upon how you take the sample and many other aspects as to whether or not you get an accurate -- as to how accurate the assay is.

Did I answer your question?

Mr. Terrell. Yes; to the extent that I don't think that anybody knows, including yourself; depending upon how much confidence you put in the analysis you did on effluent, I

don't think that you have any confidence, or anyone else, as to how much actually left the plant in the effluent that went into the river.

You are saying you were within certain Federal guidelines, certain parts per million, but how do you know that you were actually within those 'stats'?

Dr. Shapiro. By taking the assay that we did.

Mr. Terrell. Using the technique at that time?

Dr. Shapiro. That was available to us at that time.

Mr. Terrell. That is what I am saying.

What you are saying today -- obviously to the extent of your knowledge -- would you say today the techniques being utilized at the receiving and shipping end of this sort of thing is more refined to the extent that we know more clearly how much material is being received, how much is being brought in in solution, how much is being concentrated out of the process?

Dr. Shapiro. You could continuously find variance during the period of our operations.

Mr. Terrell. And did you adjust the procedures when you went back through and had it burned and assayed? Did you do anything to rectify your assay procedures?

Dr. Shapiro. Well, for --

Mr. Terrell. You know, for future work.

Dr. Shapiro. I don't recall specifically.

Mr. Terrell. There were things that you probably -- I would

think -- that you would do something along those lines.

Dr. Shapiro. It was our practice that if, obviously, we learned a lesson, that we apply that lesson.

Mr. Terrell. Yes.

Chairman Udall. Let me lay one more question on you, and then we are really going to quit. This will just take a minute.

Henry, correct me -- I am trying to find my reference, and I can't find it. With regard to this famous June 20 meeting at the Pittsburgh airport, there was something in the file that the AEC had interviewed you about that in August. The meeting was in June, and that someone at the AEC called upon you to interview you about in August, and that the information I am searching for was to the effect that, when they first contacted you about this, you had no -- expressed the feeling you had no memory of the meeting, and then later recalled a lot of details and called them back with supplemental information about the airport meeting.

Do you recall this?

Dr. Shapiro. No, I cannot.

Chairman Udall. There is no way you can give me an explanation of that, why you would forget that meeting at the airport, if indeed you did?

Dr. Shapiro. My recollection is that I have always been forthcoming about that.

Chairman Udall. About that meeting?

Dr. Shapiro. Not only that meeting, but everything pertaining to this whole issue.

Chairman Udall. Were there other airport meetings at that time? Any other time?

Dr. Shapiro. Not that I recall.

Chairman Udall. That you met an Israeli official or citizen at the airport that you can recall?

Dr. Shapiro. I may have --

Chairman Udall. In connection -- I am talking about a pre-arranged meeting where, during the time NUMEC was in operation, where you had gone to the airport to meet someone?

Dr. Shapiro. I have certainly gone to the airport to meet people. I have often done that. And I would generally go out of my way for an overseas visitor, whoever that was, whether he was from England, France, Belgium, or wherever. And it was likely that I would have done the same for an Israeli visitor.

Chairman Udall. I don't question that.

The puzzling thing about this to some people has been the idea that he made a special trip to the airport and you made a special trip to the airport and apparently a long conversation was held. That was why I was --

Dr. Shapiro. Certainly that matter has been discussed and explained many, many times.

Chairman Udall. Okay. Well, I want to thank you for coming. You have been very good to be with us and answer questions not only relating to your own knowledge but some of the speculation that we have asked you to indulge in.

I must say I don't know where we go from here. I want to ponder what has occurred today. You are a very effective witness in your own behalf and, if what you told us today is true, you have got every right to feel aggrieved about the way you have been treated.

That is all I will say in conclusion.

Mr. Krash. I want to thank you, Congressman, for -- let the record reflect -- the most courteous treatment the witness has received here, and we appreciate that very much. We do stand ready and willing to cooperate with you in any way we can in responding to any questions that you may have.

Chairman Udall. While the record is being transcribed, as I said in the beginning, feel free to supplement additional material or statements.

Mr. Krash. We understand that the reporter will give us a copy of the transcript and we will have a chance to review that.

Chairman Udall. You will, indeed.

Mr. Krash. Thank you very much.

Chairman Udall. All right. We stand adjourned.

(Whereupon, at 5:01 p.m., the meeting was adjourned.)

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House of Representatives

Transcript of Proceedings

Hearing held before

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

Washington, D. C.

INDEPENDENCE REPORTING, INC.

304 Independence Avenue, S.E.

Official Reporters

Washington, D. C. 20003

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